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In progress

THE

SURGICAL ANATOMY

OF THE

ARTERIES

OF

THE HUMAN BODY:

DESIGNED FOR THE USE OF STUDENTS IN THE DISSECTING-ROOM.

By ROBERT HARRISON, A.B. T.C.D.

MEMBER OF THE ROYAL COLLEGE OF SURGEONS IN IRELAND AND LONDON,
AND ONE OF THE DEMONSTRATORS OF ANATOMY IN THE SCHOOL OF SURGERY IN DUBLIN, UNDER THE DIRECTION OF THE COURT OF EXAMINORS OF THE ROYAL COLLEGE OF SURGEONS.

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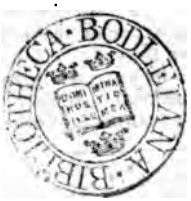

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TO

THE PRESIDENT,

MEMBERS, AND LICENTIATES,

OF

THE ROYAL COLLEGE OF SURGEONS

IN IRELAND,

THE FOLLOWING PAGES

ARE RESPECTFULLY INSCRIBED

BY THEIR

VERY OBEDIENT SERVANT,

ROBERT HARRISON.

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PREFACE.

My object in writing a description of the Surgical Anatomy of the Arteries, is to facilitate the study of the relative connexions of every blood-vessel whose magnitude can render it of practical importance, or whose peculiarity of course and termination can elucidate any physiological inquiry.

It is generally observed that a Student attends with most earnestness, and consequently with most benefit, to such anatomical descriptions as are interwoven with practical or physiological remarks: and again, that those practical or physiological

inferences are most appreciated which are drawn from anatomical relations.

Under this impression I have ventured to publish the following pages. The pupil will, I trust, find the plan which I have pursued, useful in directing and assisting his progress in the study of a science difficult and complicated, but, in his profession, useful above every other.

The description of every artery of importance I have in general prefaced by some observations as to the best mode of performing the dissection, or displaying the relative anatomy of the parts concerned.

In the description of the individual arteries, I have been particular only in proportion to the practical or physiological importance of each; and in detailing the relations of each vessel, I have first considered its coverings; secondly, the parts it

lies upon; thirdly, those which accompany it; fourthly, the branches which it distributes in this course; and lastly, I have endeavoured to direct the Student's attention to such practical inferences as may be deduced from a review of these several circumstances combined.

As to the several branches of every large artery, I have described all such as are of importance in a practical point of view, from being concerned in operations, or endangered in accidents, or occasionally of essential service in establishing collateral circulation.

Although in many of the descriptive parts I have availed myself of the writings of others, yet the reader may be assured that every description has been confirmed by numerous dissections on a great number of bodies.

It is not my intention to enter into a very minute or particular account of every small ramification of each artery; several works in the English and other languages contain an enumeration of the smallest branches, and of every variety in their origin and course that has been hitherto observed. These writings have certainly been of infinite service, and must ever be studied with interest and advantage; it appears to me, however, that an acquaintance with the relative anatomy of the principal arteries is more essential to the Surgical Student, than an extended nomenclature or systematic arrangement of the minute and numerous arterial ramifications.

In the practical remarks that are offered, I have avoided, as much as possible, references to authors or long quotations; this, I trust, will not be construed into disrespect to those who have so largely contributed to the science: in a work intended,

as this is, principally for the dissecting-room, I conceive conciseness and brevity to be most important and highly conducive to the Student's progress and convenience, as his attention, instead of being diverted from, will be thus more steadily directed to the subject immediately before him.

At the time I commenced this work, I contemplated having coloured plates explanatory of the relative anatomy in those situations where operations on the arteries may be required; on reflection, however, I abandoned the idea, as the number of drawings that were required must have added considerably to the size and expense of a work designed for the Student in the dissecting-room, and as in this city there is such abundant opportunity for cultivating practical anatomy, and studying it in the "book of nature."

In the following pages, I feel fully con-

scious of several imperfections in the description, as well as inaccuracies in the composition; the former however, I trust, will not be found of any material consequence, and the latter I hope will be excused in a work whose sole object is practical utility.

SURGICAL ANATOMY

OF THE

ARTERIES.

PREPARATORY to commencing the dissection of the arteries, they should be injected from the Aorta: to introduce a pipe into this vessel, the student should make a longitudinal incision through the integuments of the Sternum, and divide that bone with a saw in the same direction; the edges being forcibly held asunder by an assistant, or by a short iron clamp placed transversely between them; the Pericardium should be opened, and the serous membrane that connects the Aorta to the Pulmonary Artery being divided, a ligature may be passed round the former. An incision should next be made into the left Ventricle of the Heart, or into the Aorta immediately above its origin, and the pipe, with some

soft substance rolled round it, being introduced into the artery for a short distance, is to be secured by the ligature being firmly tied, and its ends brought up and fastened to the arms of the pipe. The fluid (of sufficient temperature to keep its component parts in solution) should then be injected by a large syringe furnished with a stop-cock; the syringe should be forced at first quickly, afterwards gradually, and as long as moderate resistance only is given by the vessels; the stop-cock being then turned and the syringe withdrawn, the subject should be left for a few hours before the dissection is commenced. In this way all the arterial branches except the Coronary Arteries may be filled sufficiently well for the purposes of mere dissection; but should the student wish to make preparations of particular parts, each part ought to be injected separately, being first immersed in very warm water for two or three hours. Should he desire to trace the Coronary Arteries minutely, the injection may be forced from the Aorta towards the Heart; or when the Heart is detached from the body, a small pipe may be inserted into one of these vessels, and the injection propelled through their free inosculations, so as to fill the branches of both.

It is customary to commence the dissection of the arterial system at the Aorta, and trace its ramifications throughout all parts of the body; in this order

is the following description: should the student, however, wish to direct his attention to any particular artery, the index will refer him to the page in which such vessel is described, and he may thus undertake the dissection of any particular part of the arterial system without commencing at the Aorta.

Varieties in the origin and course of arteries are very commonly observed; to give an accurate description of all such as have been noticed would be almost impossible; the student should first make himself acquainted with what we are in the habit of considering as the regular order, and afterwards with those deviations which are most frequently observed.

THE AORTA.

To examine the origin and course of this large artery, whose branches extend through all parts of the body, the Thorax may be opened in the following manner: the left half of the Sternum (which bone has been already divided for the purpose of injecting the subject) must be separated together with part of the second, third, and fourth Ribs; these bones should be sawed through, anterior to their centre, and then everted together with the Sternum; the cartilage of the first Rib being cut through, but that bone itself left in its situation; some cellular membrane behind the Sternum must now be removed, and the Pericardium being fully opened, the commencement of the Aorta is brought into view.

The Aorta arises from the upper part of the left Ventricle of the Heart, directly in front of the left Auriculo-Ventricular opening, and behind the Pulmonary Artery; the fleshy fibres of the Ventricle are not continuous with the fibres of the Aorta; both this vessel and the Pulmonary Artery are connected with the Heart in the following manner:—first, the serous layer of the Pericardium being continued from the surface of the Heart upon the arteries at their origin, serves to connect them;—secondly,

the lining membrane of the Heart is continued into each vessel, forming at their commencement the Semilunar Valves;—thirdly, the middle or fibrous coat commences abruptly at the termination of the fibres of the Heart by three semicircular portions, whose convexity is turned towards the Ventricles, the fleshy fibres of which are inserted into the edge of each of these festoons; these cover the small pouches (the Sinuses of Morgagni) that lie outside the Semilunar Valves, and thus these sinuses are rendered sufficiently firm to resist distension, as the blood is strongly pushed into them during the systole of the arteries. In the angle between the extremities of two of these the wall of the artery is formed only by the lining membrane of the Heart and serous layer of the Pericardium, which are here in apposition. If the opening of the Aorta be inspected from the cavity of the Ventricle, it appears of a triangular shape, and of much smaller caliber than the artery is immmediately above this, for it then swells out into the Sinuses of Morgagni.

If the attention of the student be directed to the relation which the origin of the Aorta bears to certain points in the parietes of the Thorax, he will find that this part of the artery is opposite the upper edge of the cartilage of the fourth Rib of the left side, at its junction to the Sternum, and to the left side of the body of the fourth Dorsal Vertebra. The

vessel, emerging from under the Pulmonary Artery and tip of the right Auricle, passes upwards, forwards, and in the direction of the Heart's axis, to the right side; then bends backwards and to the left side, and descending as far as the left side of the body of the third Dorsal Vertebra, completes what is called the arch of the Aorta. This arch, for the purpose of description, may be divided into three portions; the anterior, or ascending; the middle or transverse; and the posterior, or descending; the first, or ascending portion of the arch of the Aorta, rises as high as the upper edge of the cartilage of the second Rib on the right sight, passing in the direction of the Heart's axis, and describes a curve which is convex upwards, forwards, and to the right side; almost all this portion is within the Pericardium, its commencement is covered by the Pulmonary Artery, it afterwards lies between this vessel and the superior Vena Cava, the right Pulmonary Artery is behind it, and the Pericardium and some cellular membrane separate it from the Sternum, from which, when it is distended, it is only about a quarter of an inch distant. The left Vena Innominata is closely connected to its upper part by a dense fascia, and overlaps it towards the right ride. This portion of the arch is often very much dilated without being diseased, and is therefore sometimes named the Great Sinus of the Aorta; the highest point of which is nearly on a level with

the line of connexion between the first and second pieces of the Sternum.

In the child, however, this is by no means so large in proportion, as in more advanced life; nor is it so close to the Sternum in the young, as in the old subject.

The middle portion of the arch runs almost horizontally backwards and to the left side, ending opposite the body of the second Dorsal Vertebra; it rests on the Trachea a little above the division of that tube; its termination is connected to the Pulmonary Artery, by the ligamentous remains of the Ductus Arteriosus; the Par Vagum of the left side crosses it, and its recurrent branch hooks under it; from this part of the arch arise the three great vessels to supply the Head and superior extremities.

The third, or descending portion of the arch, is continued from the last, downwards, and backwards, between the Vertebræ and left Lung, and ends at the left side of the body of the third Dorsal Vetebra; this bone, in old subjects, is often indented on its left side, the pressure of the artery causing its absorption; the Œsophagus and Thoracic Duct lie on the right side, and somewhat in front of this portion of the arch. The Aorta then descends along the left side of the vertebral column, under the name of the Thoracic Aorta, the description of which shall be resumed after that of the branches of the arch. There is no exact distinction between the termination of the

arch and the commencement of the Thoracic Aorta; nor, as Dr. Barclay observes, does the one deserve the name of Thoracic more than the other. Before the student traces any of the branches of the Aorta, he should pay particular attention to the different relations its arch bears to several surrounding parts, and consider the effects that aneurism of this vessel is likely to produce. He should observe the curve which the Aorta makes in this course, how it first advances near to the Sternum, and then recedes to the Vertebræ; thus the aneurismal tumour may incline forwards, and cause the absorption of the Sternum and cartilages of the second and third Ribs on the right side, or may press backwards, towards the Vertebræ, and produce caries in them, hence pain and partial paralysis in the superior extremities, as in idiopathic disease of the Spine. The connexion of the arch of the Aorta with the Trachea will account for its enlargement producing irritation in that tube, and thus exciting the unceasing cough which so generally attends that disease. He should also remark the close connexion between the artery and the Vena Innominata, which explains how the lividity of the countenance and varicose condition of the cervical veins may depend on the mechanical pressure of this disease. The student should next dissect the different parts which pass through the arch of the Aorta, and observe how its concavity looks down-

wards and to the left side, bending round the root of the left Lung. The right Pulmonary Artery is the first part that he will find contained within the arch; behind this is the left branch of the Trachea, and behind this is part of the left Auricle of the Heart, posterior to which are the Œsophagus, Thoracic Duct, and recurrent branch of the left Pneumogastric Nerve. In this situation also is a mass of dark-coloured conglobate glands, called Bronchial, which are found more frequently diseased than glands in any other situation; some of these are continued along the ascending branches of the artery to the Neck, and are connected by cellular membrane and vessels to the lymphatic glands of that region; the student may very generally observe one or two of these glands buried in the recess between the arch of the Aorta and Vena Cava descendens; these I have frequently found diseased, and can easily conceive how their enlargement or suppuration may produce considerable inconvenience to the surrounding parts; that the returning blood may be impeded in the veins; that the arteries, the air-tube, &c., may be compressed, and thus give rise to a train of complaints, and even apparent symptoms, similar to those of aneurism. These glands frequently increase in size so much, that they rise out of the chest, into the cervical region; they contain a sort of semi-fluid, or soft cheesy matter, that conveys to the touch an imperfect sense of fluc-

tuation; they sometimes appear constricted or indented by the interclavicular ligament, and cervical fascia, which is very tense between the two Clavicles; these tumours often have a dull pulsation, communicated to them from the Aorta or its large branches; the integuments, too, are sometimes discoloured, and in some instances it requires very careful examination into the history and symptoms, as well as the appearance, to distinguish these from aneurismal tumours of the Aorta, or Arteria Innominata.

The student cannot fail to observe, how such an examination in the living body may be facilitated by making it in a proper position; as the subject lies on the table, with the Head thrown back, the muscles and fascia of the Neck are tense; but if he raise the Head, and support it, these parts become relaxed, and he can even insinuate his fingers a short distance into the cavity of the Thorax. In the examination of the living body, either in the sitting or recumbent posture, the Head should be bent forwards, the Shoulders also should be inclined in the same direction, in order to relax the interclavicular ligament; in some cases too, by directing the Head a little to one side, as well as downwards, and by observing the motions of the Trachea, useful information may be obtained.

When we reflect on the number and importance of the several organs connected to this small part of the

arterial system, we cannot be surprised to hear how equivocal are the symptoms of its diseases, how numerous its sympathies; and we can then also easily understand, why aneurismal tumours may take different directions, and burst in different situations.

If we look at the commencement of the arch, we see nearly two inches of it contained in the Pericardium, insulated with the Heart in the same serous membrane; it cannot then be a matter of surprise, that considerable difficulty should exist in distinguishing between aneurism of this part of the artery and organic disease of the Heart; if the tumour be situated higher up, we can understand why it should occasionally ascend into the Neck, and resemble an aneurism of the Arteria Innominata, or Carotid; should it incline backwards, towards the Vertebræ, Lungs, or Œsophagus, it may produce complaints not unlike caries of the Vertebræ, Pthisis Pulmonalis, or stricture of the Œsophagus. From an attentive observation also of the anatomical relations of the arch, we shall be able to comprehend the different directions the aneurismal tumour may take previous to its causing death by bursting; if at the commencement of the vessel, it may open into the Pericardium, or may come forwards, towards the Sternum and cartilages of the third and fourth Ribs on the left side; if situated higher up, it may appear through the cartilages of the second or third rib, as they join the Sternum on the right side; or it

may ascend into the neck, and incline a little forwards, and, being constricted by the extremities of the Clavicles and Interclavicular Ligament, may take the same direction as aneurism of the Arteria Innominata, or of the left Carotid. Cases are on record of aneurisms near the origin of the Aorta, thus bursting into the Pericardium, or becoming attached to the Pulmonary Artery, and opening into it; in other cases the tumour, directed backwards, has opened into the Trachea, or Œsophagus, or into the left Pleura, or, by causing absorption of the heads of the ribs and sides of the Vertebræ, it has protruded through the integuments at the side of the Spine.

From the arch of the Aorta arise five arteries in general; two (Coronary) immediately above the Sinuses of Morgagni; and three (Arteria Innominata, left Carotid, and left Subclavian) from the middle or transverse portion of the arch, immediately beyond the Great Sinus. Exceptions to this order frequently occur; the most common one is that of four arteries arising from the middle of the arch, the additional branch being generally the left Vertebral, arising between the left Carotid and left Subclavian: sometimes, however, the extra branch will arise from the arch between the Arteria Innominata and left Carotid, and will then go to the Thyroid Gland; the fourth branch is sometimes the right Subclavian, which, in such cases, arises from the termination of the arch,

and passes across the spine, either behind the Œsophagus, or between this tube and the Trachea. Although this may appear an extraordinary deviation from the usual course of the artery, it is by no means uncommon: for the last few years I have met with six or seven of these cases in the dissecting-room each season. A singular case is related in the 2nd vol. of the Dublin Hospital Reports, of a woman, in whose throat a small bone had stopped, and having perforated the Œsophagus, wounded this artery, which took the unusual course now described. Other irregularities we occasionally meet with in the arteries of the arch of the Aorta, but these are of rare occurrence. Sometimes there is but one Coronary Artery, sometimes there are three; the arch of the Aorta is sometimes reversed, as also the position of the Heart, so that its apex points to the right side; in such cases, too, some of the viscera of the Abdomen are transposed, the liver being in the left Hypochondrium, and the Spleen and Stomach in the right. In the museum of the School of Surgery, there is a preparation, in which the Aorta and Vena Cava are thus transposed; and in the museum of the College, there is a similar preparation, recently obtained, in which the position of the great vessels and principal viscera are all reversed. In the museum of the School of Surgery, there is a singular preparation of the Aorta dividing into two branches, im-

mediately after its origin, one ascending and the other descending; the ascending soon terminates in the vessels of the Neck and superior extremities, the descending passes backwards, and then takes the usual course along the vertebral column.

ARTERIA CORONARIA DEXTRA, VEL ANTERIOR,

ARISES immediately above the floating edge of one of the semilunar valves, and appears between the Pulmonary Artery and the right Auricle; it runs in a very tortuous manner towards the right side, between the right Auricle and Ventricle, and arriving at the anterior thin edge of the Heart, divides into three branches, a superior, inferior, and posterior; the superior continues in the groove, between the Auricle and Ventricle, around the base of the Heart, gives off numerous branches to the right Auricle and Ventricle, and anastomoses with a similar branch from the left or posterior Coronary Artery.

The second, or inferior branch, runs from the base of the Heart along the anterior thin edge of this organ to the apex, anastomosing there with several small branches from the left Coronary, this branch supplies the parietes of the right Ventricle. The third or posterior branch appears to be the continuation of this Coronary Artery, it bends downwards,

and backwwads, and runs in that line or groove which is observed on the inferior surface of the Heart, separating this from the posterior surface; this branch also joins the anastomosis at the Apex, having supplied the back part of the right Ventricle and the Septum Cordis.

ARTERIA CORONARIA SINISTRA, VEL POSTERIOR.

Is smaller than the right, arises immediately above the floating edge of one of the semilunar valves, and appears between the Pulmonary Artery and the left Auricle; it descends along the left side of the Heart, and very soon divides into two branches, a superior and inferior; the superior runs backwards round the base of the Heart between the left Auricle and Ventricle, supplying the parietes of these cavities with numerous branches, and anastomosing with the superior branch of the right Coronary. The base of the Heart is thus completely encircled by these two vessels: the inferior descends along the Septum Cordis to the apex of the Heart, and there anastomoses with the branches of the right Coronary; both Coronary Arteries supply the fleshy substance of the Heart; the largest branches go to the Ventricles; small ramifications also extend along the vessels, and, being reflected to the Pericardium, anastomose

with arteries from the Mammary, Phrenic, &c. The ascending portion of the arch sends off the Coronary Arteries only, but from the transverse or middle portion three large vessels arise, the Arteria Innominata is the most anterior, the left Carotid next, and the left Subclavian, most posterior; the two former are very near each other, and nearly conceal the Trachea at their origin, but the left Subclavian arises at some distance behind the Carotid; these three vessels arise above the reflection of the serous layer of the Pericardium, and are crossed by the Vena Innominata immmediately above their origin.

ARTERIA INNOMINATA.

Arises from the summit of the arch, ascends obliquely to the right side, and passing over the Trachea, divides opposite the Sterno-clavicular Articulation into the right Carotid and Subclavian Arteries. In the adult it measures from one inch to an inch and a half in length; it is usually longer and larger in proportion in the male than in the female.

This artery lies on the Trachea, and at its division is opposite to, but at a considerable distance from the Longus Colli Muscle; it is covered immediately at its origin by the Vena Innominata, by the

Sterno-hyoid and thyroid Muscles, also by the upper piece of the Sternum; at its termination, the sternal portion of the Sterno-mastoid Muscle also covers it; the point at which it divides is posterior to the division between the two portions of that muscle. No branch arises regularly from this artery, before its division; I have often, however, observed a small one to ascend from its middle along the front of the Trachea to the Thyroid Gland, and cellular membrane beneath it. I have so frequently seen an artery in this situation, that I have been in the habit of describing it under the name of the *Middle Thyroid Artery:* this is so common an occurrence, that it should be kept in the recollection of the practitioner, and serve as an additional reason for proceeding with great caution in the operation of Tracheotomy; it sometimes arises from the arch of the Aorta between the Arteria Innominata and left Carotid. The Arteria Innominata in some subjects ascends much higher than usual in the Neck before it divides; in some persons I have seen it distinctly pulsating on the Trachea above the Sternum. In children, the space for Tracheotomy is very limited, and the student should pay particular attention to the inconsiderable portion of the Trachea that can be exposed between the Thyroid Gland above, the Arteria and Vena Innominata, the left Carotid, and remainder of the Thymus Gland below; the deep

Thyroid Veins also descending to the Vena Innominata, obscure the Trachea very much. These, together with the great mobility of this tube, add to the danger and difficulty of this operation.

The operation of tying the Arteria Innominata, is one of modern date, and although no successful case has yet occurred, yet as it has been satisfactorily ascertained, that the circulation in the Head and right Arm are not interrupted by this artery being obstructed, and as circumstances might occur to require the surgeon to pass a ligature around it, the student may practise the operation on the dead subject in the following manner:—the subject being placed on the Back, and the Neck extended, by the Shoulders being raised a little from the table, the artery is drawn somewhat out of the Thorax into the Neck, make an incision through the integuments two inches in length along the anterior edge of the Sterno-mastoid Muscle, terminating at the sternal end of the Clavicle; from this make a transverse incision outwards above the Clavicle, about one inch and a half long, the flap of the integuments should be raised a little upwards and outwards, the sternal part of the Sterno-mastoid is thus fully exposed; behind it pass a director, on which this portion of the muscle, as also a few of its clavicular fibres, are to be divided. In performing this part of the operation, care should be taken to avoid those small veins

and arteries that lie behind this muscle, by keeping the director close to its posterior surface. The muscle being thus divided, you gently press to either side some loose adipose substance that now appears, and the surface of the Sterno-hyoid and thyroid Muscles will be exposed; the director should then be carefully insinuated behind these individually, keeping the instrument close to their fibres; these being divided, and the sides of the wound separated by broad retractors, and by carefully removing a little cellular membrane, the trunk of the right Carotid Artery may be seen arising from the Arteria Innominata, the Jugular Vein and Par Vagum being to the acromial side; the curved aneurism needle may then be passed around the Arteria Innominata, directing it from below upwards and inwards, and keeping it close to the vessel to avoid the Cardiac Nerves.

ARTERIÆ CAROTIDES COMMUNES.

THE Student may now proceed to the dissection of the Carotid Arteries. The subject being laid on the Back, in a horizontal posture, or with the Shoulders slightly raised from the table, an incision may be made through the integuments, Platisma, and Fascia, from the Sternum to the Chin, and another incision from the Chin to the cartilage of the Ear; the inte-

guments should then be dissected from the muscles, and thrown backwards. The Sterno-mastoid Muscle is then exposed, its sternal portion should be detached from the bone; and the Sterno-hyoid and thyroid Muscles being drawn inwards towards the Trachea, the sheath of the Carotid Artery and Jugular Vein is exposed. The young Student should make this important dissection neatly and slowly, first dissecting off the skin, then the Platisma; and, before removing the Fascia, he should observe its connexions,—inferiorly, to the Interclavicular Ligament, and superiorly, to the angle of the Jaw, Stylo Maxillary Ligament, Parotid Gland, and Cartilage of the Ear; also its processes, which are sent under the different muscles, and which thus connect it, in some places, to the sheath of the vessels. The muscles, superficial nerves, and veins, also may be neatly dissected, at least on one side of the neck; while on the opposite the Student may repeat the same dissection, or practise the operation of tying the artery in different situations, and then make a careful dissection of the surrounding parts.

The right and left Carotid Arteries resemble each other so closely in their course and termination, that one description may apply to both. The only important difference is, as to their origin; the right, arising from the Arteria Innominata opposite the sternal end of the Clavicle, is consequently shorter than

the left, which proceeds from the arch of the Aorta. The former is generally larger, and placed somewhat more anterior in the neck, and closer to the Trachea; these vessels, diverging and inclining backwards, ascend as high as the superior edge of the Thyroid Cartilage, or the Os Hyoides, opposite which they divide into the internal and external Carotid Arteries. The left Carotid, at its origin, is covered by the Sternum, the Vena Innominata, and a part of the remains of the Thymus Gland; after this, both Carotids are covered by the integuments, Platysma-myoides, Sterno-mastoid, hyoid, thyroid, and Omo-hyoid Muscles, as high as the Cricoid Cartilage, opposite which these muscles separating from each other, (the Sterno-mastoid inclining backwards, and the others inwards,) leave the artery very superficial, nothing but the integuments, Platysma, Facia, and a few superficial veins and nerves covering it from this point to its termination. The interval between the two Carotids, is very trifling at the lower, but at the upper part of the neck they are separated by the Larynx, Pharynx, and Œsophagus, and by the Thyroid Gland, the lobes of which somewhat overlap these vessels. The right Carotid, as it ascends in this manner, lies over the inferior Thyroid Artery, the Recurrent and Sympathetic Nerves, Longus Colli, and Rectus capitis anticus major Muscles. The left Carotid, at its origin, lies on the Trachea,

immediately afterwards on the Thoracic Duct and Œsophagus, but above this, it is similarly circumstanced with the right. About the middle of the Neck these vessels lie very near the Vertebræ, and, during life, may be compressed against these bones, in case of violent hæmorrhage from any large branch. This pressure may be effectual for a short time, but it is attended with very severe pain. Each Carotid is invested with a dense, cellular tissue, called the Sheath of the Cervical Vessels, on the anterior surface of which the Descendens Noni Nerve is generally placed; it is closely connected to it, and about the middle of the Neck, forms a plexus with some branches from the second and third Cervical Nerves; it lies, on the outside, at the upper, and on the inner side of the sheath, at the lower part of the Neck. I have often found it in the sheath behind the Jugular Vein. In addition to the artery, this sheath contains the internal Jugular Vein, and Par Vagum, or Pneumogastric Nerve; the former is most external, the latter is between the vein and artery; if the former be moderately distended, it will be seen of much greater size than the latter, and will partly conceal it. On the left side, the vein is much closer to the artery at the lower part of the Neck, than on the right: this depends on the different course of the right and left Venæ Innominatæ. Behind the sheath, are the Sympathetic and Cardiac Nerves; a chain of conglo-

bate glands lie along the great vessels of the Neck, principally on their external side, and partly concealed by the Sterno-mastoid Muscle. These are also bound down by the Cervical Facia, which adheres closely to the sheath, particularly below the angle of the Jaw. These glands are proportionally large, and numerous, in the young subject: they are frequently enlarged, and indurated by chronic inflammation; the muscles and fascia press them closely to the vessels; they become fixed, and have a pulsation communicated to them, so as to resemble Aneurism: a careful examination, however, the muscles being previously put into a relaxed position, will, in almost every case, enable the surgeon to distinguish.

Opposite the upper edge of the Thyroid Cartilage, or frequently opposite the Cornu of the Os Hyoides, each Carotid Artery divides into two branches; one may be named the external Carotid, or Carotis Superficialis; the other, which is the larger branch, the internal, or Carotis Profunda; these names being applied, not from their relative situation, but from their destination. The exact point of this division is not regular, but is generally on a level with the inferior edge of the third Cervical Vertebra. The Internal Carotid, which is to supply the Brain, lies deeper in the Neck, and more external, than the Superficial Carotid, which is destined to the super-

ficial parts of the Head, Face, &c. If the Head be depressed, or the Mouth opened, this division is sheltered by the angle of the Jaw; but if the Head be in the horizontal posture, it is nearly one inch below the level of this bony projection; and, if the Head be inclined backwards, the distance is proportionally increased. In very young children the angle of the Jaw is very obtuse, and does not descend so low as in the adult; the division of the Carotid is therefore at a greater distance at this age, from this point of bone, than in the adult. In the old, edentulous subject, the Jaw appears drawn forward, so that the distance between its angle and the division of the Carotid Artery is increased. The anatomy of the vessels and nerves about the angle of the Jaw should be studied in subjects of different ages; the space between this bone and the Ear is greater, in proportion, in the young subject, than in the adult; and again, in the edentulous subject, from a very different cause, this region is increased. Some of the primary branches of the External Carotid are found, in the adult, to be very tortuous, and almost buried within the side and angle of the Jaw; while, in the earlier and later periods of life, they appear more superficial, and can be much more easily exposed.

Before we enter on the particular description of the branches of the External Carotid, the student

should consider in what situation the common Carotid Artery may be most easily exposed in the living subject, for the purpose of passing a ligature around it, in any part of its course, if required, by disease or accident; and to impress on his mind the exact relation of the several important parts which he may expect to meet in the operation, and which he should carefully protect from injury. Numerous observations prove that the Carotid Artery may be obliterated by disease, or successfully tied without injury to the brain. The operation of tying this artery may be required for the cure of aneurism, or in case of wounds of any of its primary branches, or of aneurism by anastomosis of the vessels of the Face or orbit.

From the dissection which the Student has now made, he may perceive, that in the upper and lower regions of the Neck, this artery is very differently circumstanced with regard to the parts that cover it. From the Clavicle to the Cricoid Cartilage it is covered by three layers of muscles, and by a considerable quantity of Cellular Membrane, which lies beneath the Sterno-mastoid, in which are some large veins and small arteries. In this part of the Neck the artery is at a great depth from the surface, particularly during life, when the Sterno-mastoid Muscle, by its contraction, raises the Integuments and Fascia, so as to give the appearance of a deep cavity behind it; on the contrary, when we look at the dis-

section in the upper part of the Neck, the artery appears much more superficial, being only covered by the general investment of the Neck, from the upper edge of the Cricoid Cartilage, as far as the Digastric Muscle. Even here, however, the artery is by no means so near the surface, during life, as might be inferred from a view of it when dissected, for then the integuments were borne off the sheath of the vessel, by the prominence of the Larynx before, by the Mastoid Muscle externally, and by the side and angle of the Jaw above; so that when an incision is made into this region, in the living subject, the artery appears at some depth from the surface, in a sort of axilla, in which are some small arteries, and several veins, ascending from the Thyroid Gland to anastomose with the Jugular and Facial Veins. These veins descend along the inner edge of the Mastoid Muscle, towards the Sternum, then bend outwards beneath this last named muscle, and join either the Subclavian, or some veins coming to this trunk from the Shoulder. The Carotid Artery may be exposed in two situations in the Neck, either above the Omo-hyoid Muscle, or below it; in the former situation, the operation is attended with much less difficulty than in the latter, and may be selected in cases of wounds or aneurism of any of the large branches of the Carotid, or in aneurism by anastomosis; but the latter must generally be selected in aneurism of the trunk of

this artery. The high operation on the Carotid may be performed, in the living subject, in the following manner:—the Neck being extended as far as circumstances will permit, make an incision, about three inches long, at the side of the Os Hyoides and Larynx, commencing a little below the angle of the Jaw, and continuing it as low as the side of the Cricoid Cartilage; this incision is to divide the integuments and Platysma Myoides. The Fascia of the Neck is here very strong, and must next be divided in the same direction; it adheres to the sheath of the vessels, and to the veins which form a sort of plexus in this situation; the director, therefore, ought to be carefully insinuated beneath it, through a small opening made by the knife held in a horizontal direction; on this the Fascia may be cut safely to any extent. The operator should now proceed with great caution among several small veins that generally appear beneath this membrane;* his assistant should gently separate the edges of the wound by means of a pair of broad retractors, and the Surgeon, with the blunt end of a director, can detach the cellular connexion of these superficial vessels to the sheath. The Descendens Noni Nerve usually lies to the outside of the artery in this situation, and is not endangered in opening the sheath;

* See Note to the description of the Subclavian Artery.

its exact position, however, is very irregular. The sheath of the vessels is next to be opened, by raising a small portion of it over the artery, in a forceps, and dividing it by cautious touches of the knife held in a horizontal direction. This opening being enlarged, the internal Jugular Vein will appear, distending itself occasionally so as nearly to conceal the artery; and the Surgeon, or assistant, having gently pressed this vein, and the Par Vagum Nerve, which is attached to it, towards the Mastoid Muscle, the blunt aneurism needle may be passed round the artery, taking care to direct it from without inwards, and to keep the end of the instrument close to the vessel, so as to avoid the Sympathetic Nerve, and some of its cardiac branches, particularly the Superficialis Cordis, which lies internal to the artery and close to its sheath. As the end of the needle is made to appear on the laryngeal side of the artery, it is covered by some cellular membrane, which it has pushed before it; by dividing this on the point of the needle, the further course of the ligature round the artery is facilitated. Before he ties the vessel, the Surgeon should carefully examine whether any nerve has been included; if so, he had better withdraw the ligature, and again pass round the aneurism needle close to the artery. The ligature being tied, one end of it may be cut off, and the other placed between the edges of the wound, opposite its attachment to the artery; the integuments should then be gently

closed with adhesive plaster, and the patient, when placed in bed, should lie with his head well supported, so as to relax the muscles and vessels of the Neck.

The operation may be performed in the inferior region of the Neck in the following manner:—the Head and Neck being somewhat flexed, so as to relax the Sterno-mastoid, hyoid, and thyroid Muscles, make an incision about three inches in length parallel to the inner edge of the Mastoid Muscle, commencing opposite the Cricoid Cartilage, and terminating at a little distance above the sternal end of the Clavicle; by this incision, the integuments, platysma, and superficial fascia are to be divided; the edge of the Mastoid Muscle will be then exposed, and close to this a very considerable vein is generally situated, to which I before alluded when describing the higher operation on the Carotid Artery. The Sterno-mastoid Muscle and this vein are to be drawn outwards, and the Sterno-hyoid and thyroid Muscles inwards; the Omo-hyoid Muscle will now be seen crossing the Neck near the upper extremity of the wound; this muscle is connected to the sheath of the vessels by the deep cervical fascia, which in this situation is thin, but strong; by carefully dividing this membrane below the Omo-hyoid Muscle, the sheath of the vessels will be exposed, the Descendens Noni Nerve is here inclining to the tracheal side of the

artery, and may be drawn in that direction with the Sterno-thyroid Muscle; the sheath must now be opened in the same cautious manner as was before recommended. The Jugular Vein, by its sudden and irregular distention in the living subject, has been found to embarrass the operator, not only by nearly concealing the artery, but also by itself being in great danger of being wounded in opening the sheath; an assistant ought, therefore, to make gentle pressure on this vessel, both at the upper and lower part of the wound, for it becomes distended in both these directions, from below by the regurgitation of blood from the right Auricle of the Heart, and from above by that fluid descending from the Head and Neck; the vein and Par Vagum being then pressed to the outer side, and the muscles held apart by an assistant, the aneurism needle is to be cautiously pushed round the artery from without inwards, taking care to avoid the inferior Thyroid Artery, the Recurrent and Sympathetic Nerves which lie behind the sheath; and, if operating on the left side, to remember the proximity of the Œsophagus internally, and of the Thoracic Duct posteriorly and externally.

We may here remark an important difference in the relation of the internal Jugular Vein, to the Carotid Artery in the lower part of the Neck, on the right and left sides, depending on the different course of the right and left Venæ Innominatæ. The

left Jugular Vein lies on a plane anterior to that of the right side, and somewhat overlaps the left Carotid Artery, in order to join the left Vena Innominata, which crosses the upper orifice of the Thorax anterior to the three great arteries emerging from that cavity; whereas the Jugular Vein of the right side inclines outwards and backwards, to meet the right Subclavian Vein; the confluence of these forming the right Vena Innominata, which vein descends almost perpendicularly into the cavity of the chest.

The Student may next proceed to dissect the branches of the Carotid Artery; and first, the external Carotid and its ramifications.

ARTERIA CAROTIS EXTERNA, VEL SUPERFICIALIS.

THIS artery is rather smaller than the internal Carotid; it lies more superficial and nearer to the Os Hyoides; its course is first upwards and inwards towards the Submaxillary Gland, but it soon inclines backwards, and ascends in a direction parallel to the ramus of the lower Jaw, between it and the Meatus Auditorius; and nearly midway between the Zygomatic Process and the Angle of the Jaw, but a little nearer to the former, it divides into the temporal and internal Maxillary Arteries, in the

substance of the Parotid Gland. The external Carótid Artery is somewhat curved, the convexity directed inwards towards the Pharynx and Tonsil, the concavity outwards towards the Mastoid Muscle; in the lower part of its course it is covered only by the skin, platysma, the fascia, and some veins; opposite the Os Hyoides it is crossed by the Lingual Nerve, Digastric and Stylo-hyoid Muscles, and immediately above these it enters the Parotid Gland, lies very deep in the substance of that gland at its lower part, but approaches its surface as it ascends. About the centre of the Parotid the Portio Dura or Facial Nerve passes over the artery, separated from it by a small portion of the gland. The external Carotid in this course is not at first firmly supported, it merely rests on the Laryngeal Nerve, and Pharyngeal Plexus, and some cellular membrane which connects it to the internal Carotid and to the side of the Pharynx. Near the angle of the Jaw the Stylo-pharyngeus and Stylo-glossus Muscles lie behind this artery, which muscles, together with a portion of the Parotid Gland, and Glosso-pharyngeal Nerve, separate the external from the internal Carotid Artery. The external Carotid is accompanied by two veins, one on either side; at its commencement, a number of these vessels, anastomosing with the internal Jugular Vein, form a sort of plexus around it. The external Carotid

and its branches are surrounded by numerous nerves, from the Sympathetic.

From the view which the Student now has of this artery, it must be plain that it can be exposed in the living subject, and tied near its origin without endangering any important part, or without obstructing the internal Carotid. An incision made in the same direction and to the same extent, as was recommended in the description of the high operation on the common Carotid, will enable a Surgeon to expose this vessel below the Digastric Muscle, so as to pass a ligature around it; this might be necessary in operations about the upper part of the Neck, such as the extirpation of tumours about the angle of the Jaw, &c. This artery may also be tied above the Digastric, between it and the Parotid Gland, by an incision through the integuments and fascia from the lobe of the Ear to the Cornu of the Os Hyoides, the Digastric and Stylo-hyoid Muscles will be seen passing across the artery near the inferior end of the wound, and then, by depressing these muscles, and separating them with the handle of the knife from the Parotid Gland, the external Carotid will be brought into view, and a ligature can be passed around it. If, however, it be true that the adhesive inflammation cannot take place in any artery unless an internal coagulum of blood be formed, (an assertion which admits of doubt,) and

if this cannot occur when a large artery proceeds from the trunk near the situation of the ligature, then we cannot expect much success from the operation of tying the external Carotid, as the ligature must be applied very close to the common Carotid in order to avoid the Thyroid or other primary branches, if we wish to tie it before it gives off any; I have, however, seen this operation performed a few years since, and no secondary hæmorrhage ensued.

The external Carotid sends off ten branches, which supply the several parts near which it passes; these may be divided into three sets or orders, the Anterior, Posterior, and Ascending; the anterior branches are, the Thyroid, Lingual, and Labial; the posterior are, the Muscular, Occipital, and Posterior Auris; the ascending are, the Pharyngeal, Transversalis Faciei, Internal Maxillary and Temporal. This arrangement is, no doubt, open to several objections; I trust, however, it may serve to direct the pupil in his progress. I must apprise him, however, that he is not to expect to find the branches of the external Carotid, in the different subjects he may dissect, uniform in their number, origin, or course; on the contrary, many varieties are met with; sometimes almost all the branches arise nearly together, so that the external Carotid appears like a short axis, dividing in a radiated manner; in other cases one trunk will give rise to two or three

arteries. In others, several small vessels, arising from different sources, supply the place of some particular artery; and sometimes the common Carotid gives origin to some of the proper branches of the external Carotid. The frequent irregularities of these arteries have induced me to coincide with Dr. Barclay in rejecting, as useless and unscientific, the classification of them that has been adopted by the editor and continuator of Bichat's Anatomy, namely: first, those that supply the organs of voice and respiration; secondly, those that are ramified on the primary organs of digestion; thirdly, those that supply the superficial parts, and the deep cavities of the face; and, fourthly, those that are ramified on the parietes of the Cranium.

The Student may now proceed to trace the branches of the external Carotid Artery nearly in the order in which they have been first mentioned.

I.

ARTERIA THYROIDEA SUPERIOR, vel DESCENDENS.

Is the first branch of the external Carotid Artery; it generally arises opposite the Cornu of the Os Hyoides, but sometimes lower down. It runs upwards and inwards, then bends downwards towards the Thyroid Gland, in an arched manner, convex superiorly. It soon divides into several

branches, which pass beneath the different muscles of the Larynx; but the trunk is at first superficial; the Lingual Nerve lies superior, and the Laryngeal Nerve posterior to it. Its branches are usually considered as four in number.

1. RAMUS HYOIDEUS, is very small and irregular; passes along the inferior border of the Os Hyoides, supplies the cellular membrane between this bone and the Thyroid Cartilage, and anastomoses with the similar branch from the opposite side; it lies under the Thyro-hyoid Muscle.

2. RAMUS SUPERFICIALIS runs downwards and outwards over the sheath of the Carotid Artery, and is distributed to the glands, cellular membrane, and Sterno-mastoid Muscle.

3. RAMUS LARYNGEUS is larger than either of the last-mentioned. It often arises from the external Carotid; it accompanies the Laryngeal Nerve, runs downwards and inwards, enters the Larynx, either by an opening in the Thyroid Cartilage, or between this and the Os Hyoides, or sometimes between the Thyroid and Cricoid Cartilages. It first sends a small branch superficially, which may generally be seen on the Crico-thyroid Ligament, in the situation in which Laryngotomy is performed; it is then ramified on the muscles and lining membrane of the Larynx and Epiglottis, and anastomoses with the corresponding branches from the opposite side.

4. RAMUS THYROIDEUS is the largest branch,

and the continuation of the original trunk. It descends tortuously along the side and anterior surface of the Thyroid Gland, beneath the Sterno-thyroid Muscle; its branches penetrate the substance of the gland, in which some unite with the opposite artery, others descend to meet the inferior Thyroid from the Subclavian: a small branch generally passes in a serpentine course along the anterior part of the gland, and meets a similar branch from the opposite side. The Thyroid Artery, or its branches, are often divided in those wounds that are made by the ineffectual efforts of the Suicide, who, in attempting to divide the Larynx, seldom cuts sufficiently deep to injure the Carotid Artery; but very generally wounds the branches of the Thyroid. Should this artery be divided, the Surgeon may easily secure it; or if hæmorrhage proceed from its branches, its trunk may be exposed by making an incision through the integuments and fascia, from the Os Hyoides obliquely downwards, and outwards towards the Mastoid Muscle; some small veins only will conceal the artery. The operation of tying this vessel has been recommended in some cases of Bronchocele, in which the Thyroid Arteries have been enlarged; for, depriving the gland of its usual supply of blood, has been found in some instances to retard its future growth.

II.

ARTERIA LINGUALIS,

ARISES at a little distance above the Thyroid and below the Labial. I should, however, advise the Dissector to trace the Labial Artery and its branches, before those of the Lingual, contrary to the order in which they are here described. Both arteries frequently arise from a common trunk. The Lingual runs at first horizontally inwards, and forwards towards the Os Hyoides, and passing above the cornu of that bone, rises vertically to the inferior surface of the tongue; and, lastly, it runs horizontally forwards to the anterior extremity of this organ. From its origin to the Os Hyoides, the Lingual Artery forms an arch, convex upwards, and parallel to that of the Thyroid; the cornu of the Os Hyoides moves between these two. This portion of the artery is only covered by the common integuments, platysma and fascia of the Neck, some anastomosing veins, and lymphatic glands; it lies on the superior Laryngeal Nerve and a quantity of loose cellular membrane. From the cornu of the Os Hyoides to its termination, it is much deeper in the Neck. In this part of its course, it is covered by the Digastric Tendon, by the Hyo-glossus and Mylo-hyoid Muscles, and is placed on the middle Constrictor of the Pharynx,

and on the side of the Genio-glossus Muscle. This artery is accompanied, in part of its course, by the Lingual Nerve; from the Carotid to the cornu of the Os Hyoides the nerve is parallel, but superficial and superior to the artery; above the Os Hyoides, the Hyo-glossus Muscle separates them, the nerve being placed on the inferior surface of that muscle, the artery on its superior; but at its anterior edge the nerve and artery again approximate, and their ultimate branches are distributed together to the Tongue. The principal branches of the Lingual Artery are four.

1. RAMUS HYOIDEUS arises at the external edge of the Hyo-glossus Muscle, and runs to the Os Hyoides beneath the Digastric Tendon, and divides into several branches; these are distributed to the muscles that are attached to this bone and to the Epiglottidæan Gland, and anastomose with branches from the Thyroid Artery, and with some from the opposite side.

2. ARTERIA DORSALIS LINGUÆ arises from the Lingual Artery, while it is covered by the Hyo-glossus Muscle; it first runs outwards to the side of the Tongue, and then turns upwards and inwards to the superior surface of this organ, and anastomoses with its fellow from the opposite side, having first given branches to the Stylo-glossus Muscle, to the Tonsil, to the arches of the Palate, and to the

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mucous membrane of the Fauces and Epiglottis; this is not a regular branch, several small arteries frequently supply its place.

3. ARTERIA SUBLINGUALIS arises at the anterior edge of the Hyo-glossus Muscle; here the Lingual Artery divides into the Sublingual and Ranine; the Sublingual is exposed by raising the Mylo-hyoid Muscle; it runs forwards and outwards to the Sublingual Gland, supplies it and the mucous membrane of the Mouth and surrounding muscles; it also sometimes sends a branch to the Chin. This is also an irregular artery, it is frequently derived from the submental branch of the Facial or Labial, and then either perforates the Mylo-hyoid Muscle, or accompanies the duct of the Submaxillary Gland, which runs between that muscle and the Sublingual Gland to the Frænum Linguæ.

4. ARTERIA RANINA appears to be the continued trunk; it is exposed by detaching the Digastric, Genio-hyoid, Mylo-hyoid, and Genio-glossus Muscles from the lower Jaw, and the Hyo-glossus from the Os Hyoides, then, by dividing the Jaw at its symphisis and drawing the Tongue forwards and upwards, from the cavity of the Mouth, this artery may be seen with very little dissection; it runs along the Lingualis Muscle on the outside of the Genio-hyo-glossus, and on the inner side of the Hyo-glossus and Stylo-glossus Muscles and Sublingual Gland,

as far as the tip of the Tongue, where the arteries of opposite sides arch towards one another, and end in a delicate anastomosis. The Ranine Artery supplies the muscles as well as the substance and surface of the Tongue on either side; in the Mouth, it lies close to the side of the Frænum Linguæ, and is covered only by the mucous membrane, a small vein, and a branch of the Lingual Nerve. The Ranine Arteries of opposite sides are said not to anastomose with each other except at the extremity of the Tongue, so that the sides of this organ may be injected with different coloured fluids.

In dividing the Frænum Linguæ in children, (an operation not often required,) the point of the scissors should be directed downwards and backwards, and thus the Ranine Arteries and veins will be avoided. If a wound or ulcer on the Tongue be attended with severe hæmorrhage, which cannot be restrained by any local means, it has been suggested, that the trunk of the Lingual Artery may be exposed and tied in the Neck, by making a transverse incision through the integuments and fascia from the Os Hyoides to the Mastoid Muscle; the edges of this incision being separated, we expose the tendon of the Digastric Muscle, and below this the Lingual Nerve; the Lingual Artery lies immediately below this, and a little posterior to it, or nearer to the Vertebræ, and is partly concealed by a lymphatic gland,

some veins, and cellular membrane; the superior Thyroid Artery is inferior to it, the Laryngeal Nerve is behind it, the Pharynx is internal to it, and the Carotid Artery and Jugular Vein are to its outer side: although the Lingual Artery is here thinly covered, yet, in the living Neck, it is by no means so near the surface, as might be supposed from the appearance of these parts when dissected in the dead subject; for, during life, the integuments and fascia are so borne off the vessel by the surrounding projections, that when these superficial coverings are divided, the artery appears to lie at the bottom of a deep cavity; and even in the dead subject there is considerable difficulty in exposing it, without disturbing the surrounding parts to some extent. If, in addition to the depth at which this artery lies from the surface, we think of the number of important parts that are in its vicinity and the irregularity of its origin, we cannot consider this a very advisable operation to undertake in the living subject, or one to be preferred to that of tying the external or common Carotid, more particularly when we reflect on the position in which the patient must be placed in order to enable us to make the necessary dissection.

III.

ARTERIA LABIALIS, VEL FACIALIS, VEL MAXILLARIS EXTERNA,

ARISES a little above the Lingual, ascends obliquely inwards towards the Pharynx and Tonsil, runs in a very tortuous manner through the Submaxillary Gland, anterior to the Pterygoid Muscle and Stylo-maxillary Ligament, it then descends, winds round the side of the lower Jaw at the edge of the Masseter Muscle, then runs upwards and inwards along the Cheek to the side of the Nose, and ends at the inner Canthus of the orbit. At its origin it is covered by the common integuments and by the Digastric and Stylo-hyoid Muscles, it then sinks into the posterior or external extremity of the Submaxillary Gland; as it passes over the side of the Jaw, it is only covered by the integuments, and a few fibres of the Platysma, and Triangularis-oris Muscles; in its serpentine course on the side of the face, (in which it forms numerous turns or coils upon itself, to accommodate the motions of the parts over which it passes,) it lies buried in the fat of the Cheek, and is crossed near the angle of the Mouth by the Zygomatic Muscle, and by part of the Levator Labii Superioris.

The branches of this artery may be arranged into those sent off before it passes the Jaw, and those afterwards, or into the cervical and facial; the former are four, the latter are six in number.

1. ARTERIA PALATINA INFERIOR arises near the Carotid; it runs upwards, inwards, and backwards, between the Stylo-pharyngeus and Stylo-glossus Muscles; it divides into several branches, some of which are given to these muscles, others to the superior Constrictor, through which several pass, along with small nerves, from the Pharyngeal Plexus, to the mucous membrane of the Pharynx and Velum Palati, and to the Amygdalæ, and inosculate with the descending or superior Palatine from the internal Maxillary Artery.

2. ARTERIA TONSILLARIS arises immediately above the last, ascends between the Stylo-glossus and internal Pterygoid Muscles, to each of which it sends branches, and entering the external surface of the Tonsil, is ramified through its substance and anastomoses with the other arteries, that supply this gland, which are derived from the last mentioned branch, and from the Pharyngeal and internal Maxillary. The Tonsillitic and Palatine Arteries frequently arise from the Labial by a common trunk, which will then take the course of the Palatine, and will give off a distinct branch to the external side of the Tonsil.

3. ARTERIÆ GLANDULARES are three or four

considerable branches, which spread through the Submaxillary Gland, and in it, divide into very minute and numerous twigs, each of which, accompanied by a small vein, and a branch of the Excretory Duct, goes to one of those grains or particles, of an assemblage of which this conglomerate gland is composed. Some branches also pass to the surrounding muscles, and to the neighbouring lymphatic glands.

4. ARTERIA SUBMENTALIS arises from the Labial Artery, as this trunk leaves the gland, and before it turns round the side of the Jaw; it then runs towards the Chin, along the inferior and internal margin of the bone, giving branches to the integuments, to the Submaxillary and Lymphatic Glands, and to the Mylo-hyoid and Digastric Muscles. At the anterior insertion of this latter muscle, it divides into several branches; some of these pass beneath the Genio and Mylo-hyoid Muscles, and anastomose with the Sublingual Artery; others ascend on each side of the Digastric: some perforate the muscle itself, turn round the chin, supply the integuments and muscles there, and then ascend to anastomose with the arteries of the lower Lip, and with small branches of the Dental Artery, which escape through the mental foramen of the lower Jaw. Several small lymphatic glands lie along the course of this artery, and are connected to it by branches which they receive from it.

When any or all of these glands are enlarged, they form a firm tumour, which appears to occupy nearly the same situation as the Submaxillary Gland. A tumour of this nature, in this situation, may be removed without much difficulty; and such an operation has been considered as the extirpation of the Submaxillary Gland itself: but the removal of this body would be much more difficult than an operator might at first suppose. The Labial Artery and vein should, of course, be sacrificed; but the greatest difficulty, and one which I think almost insurmountable, without doing great violence to the surrounding parts, would be, the detaching that deep process of the gland which accompanies its duct, above the Mylo-hyoid Muscle, and which joins the Sublingual Gland, and which is also connected to the Gustatory Nerve and to the membrane of the Mouth: the depth at which this lies from the surface, the proximity of the Gustatory and Lingual Nerves, as well as of the Carotid Artery and its branches, and the manner in which the Mylo-hyoid Muscle protects this deep process, must render such an operation extremely difficult and dangerous.

As the Labial pursues its serpentine course, it gives several facial branches to either side, the most important of these are the following:—

5. ARTERIA LABIALIS INFERIOR runs to the integuments and muscles of the lower Lip, and anas-

tomoses with the Dental and with the Submental Arteries, and with the corresponding branch from the opposite side.

6. ARTERIA CORONARIA INFERIOR passes upwards and inwards, is partly covered by the Triangularis Oris, runs close to the mucous membrane of the Lip, and beneath the Orbicularis Oris Muscle, supplies this vascular part, and meets the artery from the opposite side; it also anastomoses with the inferior Labial and Dental Arteries. Inferior to this artery, are a number of those small, round, mucous glands, called Labial; these receive long, delicate branches from the Coronary Artery: in one or two of these glands the disease of Cancer frequently commences, and may proceed to some extent in this structure before the integuments become affected. The lymphatic glands, about the Submaxillary, are frequently enlarged in this species of the disease, before the skin or mucous membrane ulcerates. In one case, which I lately assisted to extirpate, a lymphatic vessel was distinctly felt leading from this part towards one of the glands beneath the Jaw; the coats of this vessel were very much thickened and indurated, so as to resemble the feel of the Vas Deferens: the Labial Glands are larger and more numerous in the lower than in the upper lip.

7. ARTERIÆ MASSETERICÆ arise from the external side of the Labial, run outwards to the Masseter and Buccinator Muscles, send branches to each

of these, and anastomose with the Temporal, Transversalis Faciei, and internal Maxillary Arteries.

8. ARTERIA CORONARIA SUPERIOR runs very tortuously to the upper Lip, lies close to its mucous surface, and is distributed to its red border, and, like the inferior Coronary, it joins the corresponding artery from the opposite side; from this anastomosis, branches ascend to the Nose, which supply the extremity of this organ, and some of these entering its cavity, inosculate on its mucous membrane with the proper nasal arteries.

9. ARTERIA NASI LATERALIS arises from the Labial, as this vessel is ascending on the Levator Labii Superioris Alœque Nasi; it is, in general, a small and irregular artery; it spreads its branches on the side of the Nose, and anastomoses with its fellow, and with branches descending from the Forehead.

10. ARTERIA ANGULARIS is the last branch of the Labial; it ascends between the origins of the Levator Labii Superioris Alæque Nasi, to the inner angle of the Orbit; is accompanied by a large vein, sends branches outwards to the cheek and inferior Palpebra; these anastomose with the Infraorbital Artery. The Angular Artery then gives branches to the lachrymal sac and Orbicularis Muscle, and terminates in a free anastomosis with the Nasal and Frontal branches of the Opthalmic Artery.

The Labial or Facial Arteries have numerous inosculations on the Face, not only with one another, but with arteries from distant sources; inferiorly, they anastomose with the Dental; externally, towards the Masseter Muscle, they inosculate freely and repeatedly with the Transverse Arteries of the Face, with the Temporal, with muscular branches from the internal Maxillary, and with the Infra Orbital; and, superiorly, with the Frontal and Opthalmic Arteries, which are derived from the internal Carotid. As the Facial Arteries are passing over the side of the Jaw, they can be very easily compressed against the bone; this is usually done in operations on the lips, to obviate the inconvenience of hæmorrhage. Although this is a very general practice, yet it is seldom of much efficacy, for the several inosculations carry the blood to the Coronary Arteries as abundantly as if the labial vessels were free. A more effectual method of preventing hæmorrhage is, for the assistant to press the Lip between his finger and thumb on one side of the part to be excised, while the Surgeon, with the fingers of his left hand, presses the Lip on the opposite side.* The Coronary Arteries are always close to the mucous membrane of the Lips, and, during life, can be felt pulsating on the inner surface

* There are very neat small Tourniquets constructed for this purpose, which screw on the angles of the Mouth, and command these arteries effectually.

of their red border. Blows or falls, by forcing the Lip against the Teeth, sometimes wound these vessels, and cause very copious bleeding; in such cases the Surgeon need only evert the Lip, and secure the vessel by the tenaculum and ligature, or with a single stitch, without injuring the integuments.

When the Lip has been divided, either for the removal of hare-lip, or of a diseased portion, and that the edges are to be closed by suture, care should be taken to pass the needle nearly through the red border on each side. If the edges be closed only on the cutaneous surface, the Coronary Arteries will bleed into the Mouth, in consequence of the internal edges of the wound retracting, and the hæmorrhage will require the Surgeon to re-open the part, and pass the suture through the substance of the Lip.

As the Angular Vein and Artery lie near the edge of the Orbit, the Surgeon, in order to avoid injuring them in opening the lachrymal sac, in cases of Fistula Lachrymalis, should cut to their external side.

The second set, or order of branches, is the posterior, of which we generally see three, the Musculares, Occipitalis, and Posterior Auris.

IV.

ARTERIA STERNO-MASTOIDEA, VEL MUSCULARIS.

THIS artery, though not generally described by anatomical writers, yet is so frequently present, that

I think it may be considered as one of the regular posterior branches. Its origin is not uniform; it generally arises from the external Carotid, opposite to the origin of the Thyroid; but it sometimes comes from the Thyroid itself, or from the Occipital, and I have seen it arising from the common Carotid, a little before the division of that trunk. From its origin this artery inclines downwards and outwards to the Sterno-mastoid Muscle, supplies the lymphatic glands in its course, and then divides into several branches, most of which enter that muscle. A large one generally accompanies the Spinal Accessory Nerve through the muscle, and anastomoses with some of the Cervical Branches of the Subclavian, between the Trapezius and Sterno-mastoideus. In the last-named muscle they also inosculate with branches from the Occipital, Thyroid, and Subclavian Arteries. This artery also sends branches to the deep muscles on the anterior part of the Neck, the Scaleni, and Rectus Capitis Anticus Major; these also inosculate with arteries from the Subclavian.

V.

ARTERIA OCCIPITALIS,

ARISES from the outside of the external Carotid, at the lower margin of the Digastric Muscle, opposite the Lingual or Labial Artery, but is smaller than either

of these vessels; it runs upwards and backwards, parallel to, and concealed by the posterior belly of the Digastric, passes above the Transverse Process of the Atlas, and is buried in a groove in the Temporal Bone on the inside of its Mastoid Process, it then runs horizontally backwards on the Occipital Bone parallel to the transverse ridge of that bone, near the centre of which it rises vertically, and divides into wide spreading branches on the back of the Cranium. The Occipital Artery at its origin has the ninth pair of nerves passing round it, and is concealed by the Stylo-mastoid, Stylo-hyoid, and Digastric Muscles, and by part of the Parotid Gland; superiorly and posteriorly to these, it is covered by the Trachelo-mastoideus, Splenius Capitis, Complexus, and Trapezius Muscles, and ultimately it is covered only by the Scalp: the artery at first passes over the internal Carotid, Jugular Vein, Par Vagum, and Spinal Accessory Nerves, it then lies on the Rectus Capitis Lateralis; as it inclines backwards, beneath the Complexus, it crosses the superior attachment of the posterior Recti and Obliqui Muscles, and terminates on the Occipital Bone. The Occipital Artery soon after its origin gives small branches to the Mastoid Muscle, Lymphatic Glands, and Parotid; as it crosses the Jugular Vein, it sends a small branch upwards along this vessel, named the Posterior Meningeal Artery, this branch enters the

Cranium by the Foramen Lacerum Posterius, and supplies the Dura Mater in the inferior and posterior part of the Cranium. As the Occipital Artery passes above the Atlas, it gives off several short branches, some of which anastomose with the Vertebral Artery, and others supply the small deep-seated muscles on the back of the Neck; while the Occipital is covered by the Trapezius and Complexus, it sends down several long and tortuous branches to supply the muscles in this region; some of these lie almost close to the vertebræ, are covered by the Splenius Capitis and Complexus, and anastomose with the Cervicalis Profunda Artery, from the Subclavian; others run superficially, being only covered by the Trapezius, and inosculate with the Arteria Cervicalis Superficialis, a branch from the Transversalis Colli.

In a well injected subject, these arteries are found large and numerous, and keep up a free connexion with the arteries about the Shoulder; a connexion that must be of essential service in conducting the blood to the superior extremity in cases of obliteration of the Subclavian Artery in consequence of operation or disease; as the Occipital Artery ascends on the back of the Cranium, it is accompanied by a large nerve, (the posterior branch of the first Cervical,) both perforate the tendinous attachment of the Trapezius Muscle to the Occipital Bone, and divide into numerous ramifications. Some small

and delicate arteries go to the posterior belly of the Occipito Frontalis Muscle; one or two pierce the Occipital, or the Temporal Bone, and supply the Dura Mater; others, and the principal branches, spread out in the Scalp in all directions, they are wonderfully tortuous, particularly in old subjects; all these branches divide in the integuments with the greatest minuteness, and anastomose with the ultimate divisions of the opposite Occipital, and with those of the posterior Auris, and posterior Temporal Arteries.

VI.

ARTERIA POSTERIOR AURIS,

Is one of the smallest and most irregular branches of the external Carotid; it very often arises from the Occipital; in some subjects a few small branches from this artery appear to supply its place; when regular, it arises from the external Carotid above the Digastric and Stylo-hyoid Muscles, opposite the point of the Styloid Process, and is partly concealed by the Parotid Gland, in the posterior part of which it is imbedded; it runs upwards and backwards between the Ear and Mastoid Process, then ascends on the Temporal Bone, and divides into two branches; the anterior branch becomes attached

to the posterior part of the cartilage of the Ear, on which it ramifies minutely; the posterior ascends on the side of the Cranium, supplies the back part of the Temporal Muscle, the integuments, &c., and anastomoses with the Temporal and Occipital Arteries; in this course the Posterior Auris gives off small branches to the Digastric, Stylo-hyoid, and Mastoid Muscles, and also to the Parotid Gland: as it approaches the Mastoid Process, it lies behind the Portio Dura, and there separates this nerve from the Spinal Accessory. The Posterior Auris sends off a delicate branch, which enters the Stylo-mastoid Foramen, ramifies throughout the Temporal Bone, supplying the Tympanum, Mastoid Cells, Semicircular Canals, &c., and anastomoses with other arteries which the organ of hearing receives from branches of the Meningeal and Basilar Arteries. The branches of the Posterior Auris sometimes increase in number and size, so as to give rise to the disease of Aneurism by anastomosis in the figured portion of the Ear; in this disease there is considerable swelling, pain, and redness, with a sensation of great throbbing in the part: in one case of this disease, I saw the operation performed of tying this artery in front of the Mastoid Process, but with very little effect; the progress of the disease was suspended only for a few days, the pain and tension were relieved during that short period, after

which all the symptoms returned, and the disease continued unabated.

In dissecting this artery and its branches, the student should observe the situation and course of the Portio Dura, or Facial Nerve, the distance of the Stylo-mastoid Foramen from the surface, and the manner in which the nerve, immediately on escaping from this opening, bends forwards and enters the Parotid Gland. In those cases of Tic Douloureux, in which pain and spasm extend in the course of this nerve or of its branches, it has been recommended to remove a portion of it before it enters the Parotid Gland; this operation is attended with considerable difficulty, owing to the projection of the Mastoid Process, and to the depth of the Stylo-mastoid Foramen from the surface; the Parotid Gland also must be injured; the Superficialis Colli Nerve will, most probably, be divided as well as the Posterior Auris Artery, and some of the branches of the Occipital; these vessels will pour their blood into the deep cavity around, and so obscure the view of the nerve. I have found this nerve to give off some branches immediately on leaving the Foramen, these join the eighth pair of nerves and the sympathetic, so near the base of Cranium, that I think it scarcely possible, in the adult subject, to remove a portion of it before it has given off these deep branches, without making a more free dissec-

tion of the surrounding parts, than could be considered safe or judicious. In the child, this dissection will be found much less difficult, in consequence of the slight projection of the Mastoid Process, and the shortness of the Meatus Auditorius Externus, the Stylo-mastoid Foramen is consequently much nearer to the surface, neither is the Parotid Gland so closely connected to the Mastoid Process in the young, as it is in the adult subject.

The third order of branches from the external Carotid Artery, is the ascending, which may be considered as four in number; namely, the Pharyngea Ascendens, the Transversalis Faciei, the Temporalis and Maxillaris Interna. The two latter may be considered as terminating the external Carotid, and some consider the Transversalis Faciei as a branch only from the Temporal.

VII.

ARTERIA PHARYNGEA ASCENDENS,

Is smaller than the Posterior Auris; it lies very deep, being concealed by the external Carotid Artery and its branches, and also by the Stylo-pharyngeus and Pterygoid Muscles. It arises from the posterior part of the external Carotid, near the division of the common Carotid, and ascends to the base of the Cra-

nium, between the Pharynx and the internal Carotid. In order to obtain a satisfactory view of the course and termination of this artery, the Student should cut across the Labial and Lingual Arteries; then, drawing the external Carotid outwards, towards the Mastoid Muscle, the Pharyngeal Artery may be seen ascending along the side of the Pharynx, lying on the Rectus Capitis Anticus Major Muscle, and close to the superior ganglion of the Sympathetic Nerve;—the small branches, however, which it sends to the base of the Cranium cannot be fully exposed without dividing the lower Jaw at the Symphysis, and dislocating it on one side; but this I should not advise the Student to do in the present stage of the dissection, as the branches of the Pharyngeal may be seen more distinctly afterwards, when he is tracing the internal Carotid. As the Pharyngeal Artery ascends by the side of the Pharynx, it gives off branches internally and externally; the former are three or four in number, two of which descend to supply the middle and inferior Constrictors of the Pharynx, and the Stylo-pharyngeus Muscle; these end in numerous and minute ramifications on the mucous membrane of the Pharynx, and are completely interwoven with the Pharyngeal Plexus of nerves; the larger of the internal branches pass inwards to the superior Constrictor; in a well injected subject, these are of considerable size, and very tortuous; many of them

extend to the Velum and its muscles, to the Amygdalæ and arches of the palate. From the external side of the Pharyngeal proceed several arteries to the Sympathetic, Lingual, and Pneumogastric Nerves, also to the Anterior Recti Muscles; finally, when the Pharyngeal Artery has arrived at the base of the Cranium, it becomes very tortuous, lying in a quantity of loose adipose substance, beneath the Petrous Bone, and rather behind the upper Constrictor of the Pharynx; it here sends in a lash of branches, some of which are still distributed to the Pharynx; two or three twine around the Eustachian Tube, ramify minutely on the mucous membrane, which is continued from its trumpet mouth to the posterior Nares, these inosculate with the Nasal Arteries; others pass through the Foramina in basi cranii to the Dura Mater; one passes backwards to the Jugular Vein, and enters the Cranium by the posterior lacerated opening; one ascends directly from the Eustachian Tube, and perforates the cartilage that fills up the space between the Petrous Bone and body of the Sphenoid, a space which, in the dry skull, is named Foramen Lacerum Anterius basis cranii: a small branch also passes through the lingual foramen of the Occipital Bone. All these arteries serve the double purpose of supplying the bones with their nutritious vessels, and nourishing the Dura Mater.

VIII.

ARTERIA TRANSVERSALIS FACIEI,

Is the second branch I have classed among those that ascend from the Carotid, although I am aware that the irregularity of its origin ought almost to preclude it from such an arrangement; for, I believe it arises from the Temporal, as frequently as from the Carotid; nor does the direction of its course, as its name implies, strictly entitle it to the appellation of an ascending branch. Its proximity, however, to the Temporal and internal Maxillary, has induced me to arrange it with these arteries. The Transversalis Faciei Artery arises from the external Carotid, in the Parotid Gland, a little above the angle of the Jaw; runs upwards and forwards through the gland to its anterior edge; is surrounded by several filaments from the Portio Dura Nerve; it then crosses the Masseter, a little below the Zygoma, and accompanies the Parotid Duct, lying superior to it, and partly covered by the Socia Parotidis. At the anterior edge of the Masseter it divides into ascending and descending branches, which supply the muscles of the face, and inosculate freely with the Infra Orbital and Labial Arteries. This artery is very uncertain as to size and origin; it frequently crosses the Masseter near its inferior attachment, and below

the Parotid Duct; and sometimes there are two arteries arising distinctly, one from the Carotid, the other from the Temporal; both of which take a transverse direction, and terminate in a free anastomosis on the face. The Transversalis Faciei gives several branches to the Parotid Gland, and to the Masseter Muscle, in addition to which that muscle receives small arteries from the Carotid itself; these have been named by Portal, *Arteriæ Masstericæ*.

IX.

ARTERIA TEMPORALIS SUPERFICIALIS.

About midway between the angle and condyle of the Jaw, the external Carotid divides into the Temporal and internal Maxillary Arteries; the latter is the larger of the two, but the former, from the direction of its course, appears as the continued trunk. For obvious reasons, it is better for the student to trace this vessel to its termination before he commences the complicated dissection of the internal Maxillary, with the description of which I shall conclude that of the branches of the external Carotid. The Temporal Artery gradually emerges from the Parotid Gland, ascends between the Meatus Auditorius and articulation of the Maxilla, passes over the root of the Zygoma, and, about one inch and a half above

this, it divides into two principal branches, an anterior and posterior. This artery is at first concealed by part of the Parotid Gland; as it passes over the Zygoma it is crossed by the small anterior muscle of the Ear, and, for a little distance above this, is covered by part of the dense fascia of the Parotid which adheres to the cartilage of the Ear, and which is continued for some distance on the artery. In this situation, two or three veins partially cover the vessel, and a lymphatic gland is also frequently attached to it; it is also accompanied by branches of the Portio Dura Nerve: afterwards, as the Temporal Artery and its branches ascend on the Temporal Aponeurosis, they are only covered by the common integuments. As the artery passes through the Parotid Gland, in addition to branches to its substance, it gives off—

1. ARTERIÆ ANTERIORES AURIS, and

2. ARTERIÆ CAPSULARES: these are uncertain in number and magnitude; the former, as their name implies, are distributed to the anterior part of the Ear; the latter, to the capsular ligament of the lower Jaw.

3. ARTERIA TEMPORALIS MEDIA arises from the Temporal, immediately after it passes the Zygoma; it penetrates the temporal aponeurosis, and ramifies through the Temporal Muscle, in which it anastomoses with the deep temporal arteries from the internal Maxillary.

4. ARTERIA TEMPORALIS POSTERIOR arches upwards and backwards, spreading its branches in all directions to supply the Scalp and Occipito Frontalis Muscle, and to anastomose with the Posterior Auris and Occipital Arteries.

5. ARTERIA TEMPORALIS ANTERIOR takes a contrary direction, runs upwards and forwards towards the Superciliary Arch; its branches are distributed to the integuments, Orbicularis Palpebrarum, and muscles of the Forehead, and anastomose with the Supra Orbital and Frontal Branches of the Ophthalmic Artery.

The anterior branch of the Temporal is usually selected for the operation of Arteriotomy, in cases of inflammation of the Eye, or affections of the Brain. In order to open this artery effectually, the Surgeon should first feel it pulsating, with two fingers of his left hand, then pressing these gently against the vessel, at a little distance from each other, so as to fix it in its place, he should open it between these obliquely with the lancet. If the Student examine the artery near the Zygoma, he will observe that it is covered for some extent by the dense fascia of the Parotid Gland; this covering is a cause of considerable difficulty in suppressing hæmorrhage when Arteriotomy has been performed in this situation, and if pressure be applied sufficient to command the artery, a sloughing may ensue which will occa-

sion a troublesome and embarrassing secondary hæmorrhage; or it may give rise to an alarming erysipelatous inflammation, bringing the life of the patient into imminent danger. I have also known other unpleasant effects produced by opening the Temporal Artery near the Zygoma, such as severe pain both at the time of the operation and afterwards, probably from a branch of the Portio Dura having been wounded, inflammation extending to the Parotid Gland or Meatus Auditorius, and sometimes terminating in tedious abscesses, &c. &c.; and, as the artery is here partly covered by some veins which may be wounded in the operation, a varicose aneurism may be formed; for these reasons, I should advise the Student against the practice of indiscriminately opening the Temporal Artery near the Zygoma.

X.

ARTERIA MAXILLARIS INTERNA,

Is larger than the Temporal, from which it passes off nearly at right angles to the inside of the ramus of the Jaw: the dissection of this artery is difficult and confused; it may assist the student to have a dry skull and lower Jaw before him, and on these first trace the course of the artery, and gain a clear idea of the relative situation of the different processes or foramina, to which this vessel or its branches are connected. The internal Maxillary is very tortuous, it runs from the ramus of the Jaw, first inwards and a little downwards, then ascends, and inclines forwards, inwards, and upwards, to the posterior part of the Orbit; it here descends into the Pterygo-maxillary Fossa, and divides into its terminating branches. In order to obtain a satisfactory view of the origin of this artery, and of the first part of its course, the student should remove the greater part of the Parotid Gland; in doing this, he should carefully study the different relations of this organ to the surrounding muscles, vessels, and nerves.

The Parotid, like most conglomerate glands, does not possess a distinct capsule, so that its exact form

or extent is not limited ; it is true, it is bound down and confined to a regular situation by the strong fascia of the Neck, which fascia is continued over it, adheres posteriorly to the Mastoid Muscle and Process, and to the cartilage of the Ear; superiorly to the Zygoma, anteriorly to the Masseter Muscle, and inferiorly to the angle of the Jaw, behind which it sends in a process to be connected to the Stylo-maxillary Ligament, by which the Parotid is separated from the Submaxillary Gland. When this fascia is raised, the superficial extent of the Parotid is exposed; it is observed to ascend as high as the Zygoma, to which its superior margin is parallel; inferiorly it will rest on a line drawn from the Mastoid Process to the angle of the Jaw, posteriorly, it is moulded on the cartilage of the Ear and edge of the Mastoid and Digastric Muscles, insinuating itself between these ; anteriorly it extends over the posterior third of the Masseter Muscle, while a process of the gland, named Socia Parotidis, which lies above the duct, runs across the upper part of the Masseter Muscle to its anterior edge ; the duct takes an arched course from the edge of the gland to the Buccinator Muscle, which it perforates opposite the second Molar Tooth of the superior Maxilla ; a line drawn from the Meatus Auditorius, to midway between the angle of the Mouth, and root of the Nose, nearly defines the

course of this canal. I mentioned before, that the Transversalis Faciei Artery, and Socia Parotidis lie superior to it; it is accompanied by several branches of the Portio Dura Nerve; before perforating the Buccinator Muscle the Facial Vein crosses it; the artery is nearer the angle of the Mouth. Several lymphatic glands may be observed to be connected to the Parotid; one or two are imbedded in it, in front of the cartilage of the Ear, and opposite the division of the external Carotid Artery; three or four are generally found along the inferior border of the gland and the Digastric Muscle.

The Student having studied these boundaries of the gland, may now proceed to remove it; and in doing this, he should carefully remark the great depth to which it passes, and observe its important connexion to the deep-seated muscles, nerves, and vessels. First divide the Parotid Duct and its accompanying arteries and nerves, and raise them, together with the anterior part of the gland, from the Masseter Muscle and ramus of the Jaw; turning this portion of the gland backwards towards the Ear, next divide the Temporal Vessels, and detach the gland at its superior extremity, then separate it from the cartilage of the Ear, from the Mastoid and Digastric Muscles, dividing the Portio Dura Nerve; the circumference of the gland is thus completely loosened; and now if the Student grasp it

firmly with a view to twist or tear it out of its situation, he will find it impossible to do so; he may even raise the Head of the subject from the table, or break the gland, before he can dislodge it from the deep recess into which it extends itself. This is the part of the gland, the connexion of which the Student is next to examine; he may observe that it fills the Glenoid Cavity between the capsular ligament of the Jaw and the Meatus Auditorius; on drawing it out of this cavity, a process of the gland is seen to pass inside the ramus of the Jaw with the internal Maxillary Vein and Artery, between the bone and internal lateral ligament, and to touch the inferior Maxillary Nerve; this process often swells out between the two Pterygoid Muscles into a considerable mass, connected like a distinct lobe to the body of the gland by the narrow neck that passes on the inside of the ramus of the bone. When this has been dissected out of its situation, and the gland drawn towards the Neck, a thick portion of it is seen sinking in between the Mastoid Process of the Temporal Bone, and the angle of the Jaw, and resting on the Styloid Process, around which it is completely folded, so as to come in contact with the great vessels and nerves at the base of the Cranium: to this part of the gland the Student should pay particular attention; if both veins and arteries have been injected, he may perceive the proximity of the great Jugular Vein, as

well as of the internal Carotid Artery; as the gland passes behind the Styloid Process it touches the vein and eighth and ninth pairs of nerves, while anterior to this process, it rests on the Carotid Artery and Sympathetic Nerve; this portion of the gland is also extended above the Stylo-maxillary Ligament, and is attached to the internal Pterygoid Muscle, where it enlarges very considerably; the manner in which this deep lobe of the gland is thus impacted between the Styloid and Mastoid Processes, and again between the Styloid Process and angle of the Jaw, explains the difficulty of tearing it out of this situation, as some authors have described as not only being practicable, but as having been absolutely performed, and that, too, in cases of enlargement and disease! Before the Student proceeds with the dissection of the internal Maxillary, let him again consider the numerous connexions of the Parotid Gland, let him open the anterior or superficial lobe of it, and expose the ramifications of the Facial Nerve, and the branching of the external Carotid, also the large veins descending from the Temple and meeting the great trunk of the internal Maxillary, which comes from within the ramus of the Jaw, let him reflect on the serious injury that must be inflicted in attempting to remove even this part of the gland, which, however, is comparatively easy to that of the deeper portion, which I must declare, in my opinion, to be impracticable in the living subject, without committing vio-

lence worse than the disease we wish to remove, or without endangering parts, an injury of which must be certainly fatal. When we consider these natural impediments to the extirpation of this gland, and how these must be increased by disease, and when we take into consideration also, that malignant diseases of this gland are very rare, it is impossible not to question the correctness of those superficial accounts which are written of the extirpation of this gland, as of an ordinary tumour; Mr. Allan Burns, in his invaluable work on the Surgical Anatomy of the Head and Neck, expresses himself so strongly, and in such accordance with my own sentiments on this point of practical anatomy, that I shall transcribe his words:—

"The Parotid Gland is sunk so deep, and is so "firmly locked in between the ascending plate of the "lower Jaw and the Mastoid Process, that when it "becomes diseased the patient cannot open his "Mouth, and, from the effect of the fascia, the "tumour is flat; its extirpation is quite out of the "question; its impracticability is proved by review-"ing the connexions of the gland; whoever has in "situ injected the gland with mercury, and then, even "where it was healthy and free from preternatural "adhesions, and limited to its natural size, has tried "to cut it out, would be convinced, when he saw "the mercury running from innumerable pores, that

" the gland extends into recesses in which he could " not trace it in the living body; if this be true in " health, what must it be in disease, where the " parts are wedged and nitched into every interstice " around? Those who assert, that they have ex- " tirpated the Parotid Gland, have, I am fully con- " vinced, mistaken that little conglobate gland, " which lies imbedded in its substance, and which does " sometimes enlarge, producing a tumour resem- " bling a diseased Parotid, for the Parotid itself."

In order to obtain a satisfactory view of the course of the internal Maxillary Artery, and of its principal branches, the Student may first make a vertical section of the Head and Face at one side of the Septum Narium, then dividing the Zygomatic Process near its root with the saw, also the Malar Bone at its junction with the Frontal, and again, above its connexion to the Superior Maxillary, the Zygomatic Arch may be raised; the side of the lower Jaw (which bone has been already divided at the Symphisis) may be drawn outwards and backwards, so as to partially luxate the Condyle, the Coronoid Process may be cut off near its root, and removed with part of the Temporal Muscle, a considerable quantity of loose adipose substance which extends from between the Pterygoid Muscles to the Buccinator should then be torn away, and the tortuous course of the Internal Maxillary Artery will be

partly exposed. This artery, at its origin, is imbedded in the Parotid Gland, and is nearly on a level with the lower extremity of the lobe of the Ear; it first bends downwards and inwards between the ramus of the Jaw and its internal lateral ligament, which is inserted into the edge of the Dental Foramen; the artery then inclining inwards, enters a space which is bounded above by the external Pterygoid Muscle, below by the internal Pterygoid, internally by the Buccinator, and externally, or towards the surface by the ramus of the Jaw and insertion of the Temporal Muscle, through this space the artery runs in a very tortuous manner, it then winds over the External Pterygoid, and lies between it and the Temporal Muscle; lastly, it turns downwards, forwards, and inwards, between the two origins of the external Pterygoid, into the Pterygo Maxillary Fossa.

The internal Maxillary Artery is remarkable for the number of its branches; these may be arranged into three sets;—first, Those derived from the artery while it is between the neck of the lower Jaw, and the internal lateral ligament;—secondly, Those that are given off, while the artery is surrounded by muscles;—and lastly, The terminating branches which arise in the Pterygo Maxillary Fossa.

FIRST ORDER.

1. ARTERIA MENINGEA MEDIA is one of the largest branches of the internal Maxillary, it arises from the superior part of the artery on the inside of the neck of the lower Jaw, ascends vertically to the base of the Cranium, between the internal lateral ligament and the Tensor Palati Muscle, gives off branches to the parts on either side, and near the base of the Cranium, it sends small arteries to the Eustachian Tube, some of which enter the Tympanum and supply the muscles in that cavity, the artery then enters the foramen in the spinous portion of the Sphenoid Bone. The course of the Arteria Media, within the Cranium, may be seen without removing the Dura Mater; it passes outwards and upwards, ramifying on the internal surface of the Temporal and Parietal Bones; in this course, passing off the Spinous Process of the Sphenoid Bone, it grooves the squamous part of the Temporal along its anterior margin, sending several branches posteriorly; it also sends smaller branches forwards towards the Orbit, some of which enter that cavity through the Foramen Lacerum, and anastomose with branches of the Ophthalmic Artery. The middle Meningeal Artery then ascends

to the anterior and inferior angle of the Parietal Bone, which it grooves very deeply; in some instances it is perfectly enclosed in bone, and separated from the Dura Mater; it then divides into a number of ramifications, one large branch ascends towards the Vertex, parallel and posterior to the Caronal Suture, the other branches all extend upwards and backwards, and gradually end in minute twigs, some of which go to the Dura Mater, others to nourish the bones of the Cranium. Although this artery is commonly called, the Middle Artery of the Dura Mater, (which name appears to imply that it belongs exclusively to that membrane,) yet it appears at least equally destined to be a nutritious vessel to the bones of the Cranium, for it lies external to the Dura Mater, and not between its laminæ; and when minutely injected in the fœtus, (at which age it is proportionably larger than in the adult,) the injection does not colour the Dura Mater, but displays the vascularity of the bone; branches are certainly sent to the former, but not more than the Periosteum receives from the nutritious vessels of any bone.

I have always considered the bones of the Cranium to receive their principal supply of blood from their internal surface; to this, the Dura Mater has a much more vascular connexion than the Pericranium has to their external surface; this is equally obvious in the young and old subject, in both the Dura Mater

adheres more intimately to the bones than the Pericranium does; and even in the oldest Skull, when its external table appears white and polished after the Pericranium is detached, the internal surface will be found dotted with numerous red spots, which are the extremities of the ruptured vessels which served to connect the Dura Mater to the bone. The separation or destruction of a portion of the Pericranium in the living subject, is not necessarily, nor even commonly, followed by the death of the exposed bone, whereas, this is almost uniformly the consequence of a separation of the Dura Mater from any part of the Cranium. Near the sutures the bones receive branches from without, which anastomose with the vessels of the Diploe, and with those on their internal surface; processes or prominent parts also receive distinct arteries from those in the vicinity, as we observe in the Superciliary Arch, in the Mastoid Process, and in the irregular projections of the Occipital Bone; in the base of the Cranium too, the bones are not only supplied from the arteries of the Dura Mater, but also receive innumerable branches from the Pharyngeal, and internal Maxillary, and from every other artery in that situation.

Blows or falls on the side of the Cranium sometimes rupture the trunk or branches of the Meningeal Artery, which cause so great an effusion of

blood between the Dura Mater and bone, as to compress the former against the Brain, and consequently disturb or suspend the functions of the nervous system; this effusion of blood may occur in some instances without the Skull being fractured, in others, the wound of the artery may be caused by a spicula of broken bone; in either case, when the bone has been removed, the hæmorrhage can be restrained by very slight compression—a small dossil of lint is sufficient; this fact has very properly removed all apprehension from the minds of modern Surgeons of applying the Trepan over the line of this artery. All the arteries within the Cranium are very delicate in their structure, they more resemble veins, and appear to be almost deprived of the middle or elastic coat, at least this is so weak as not to bear off any pressure that may be applied; whether this be the proper explanation, for such slight means being sufficient to restrain hæmorrhage of an artery of this size, or whether it depend on the debility induced by the injury or by the operation, I cannot pretend to decide.

2. ARTERIA DENTALIS, VEL MAXILLARIS INFERIOR, arises opposite the last described artery; it descends with the Dental Nerve, between the internal lateral ligament and the neck of the lower Jaw, gives a few small branches to the internal Pterygoid Muscle, to the superior Constrictor of the

Pharynx, and to the mucous membrane of the Mouth and Fauces; it also gives a long branch to the Mylohyoid Muscle, it then enters the Dental Foramen, and takes the course of the Canal, which traverses the sides and body of the lower Jaw; beneath each of the Alveoli branches ascend from it to supply the Teeth, these enter the small pores in the extremity of each Tooth, and supply their internal bony structure. The Dental Artery terminates anteriorly, by dividing into two branches, one continues in the canal beneath the Incisores, the other escapes through the Mental Foramen, which is beneath the Canine Teeth, and divides into several small branches which anastomose with the Submental, inferior Labial, and inferior Coronary Arteries; this branch is also accompanied by a branch of the Dental Nerve; if the Dental Artery be injected minutely, and the lower Jaw corroded in a weak acid, the Alveolar Branches may be beautifully displayed, particularly if the bone be from a subject about eight years of age. In the operation of extracting the last Molar Tooth, the trunk of the Dental Artery has been injured, and has bled profusely: the anterior edge of the Dental Foramen is about half an inch distant from the crown of this Tooth, but the Dental Canal is immediately below its roots, and in the extraction of these, the Dental Nerve and Artery may be lacerated. In some persons, and perhaps from some constitutional cause, the extraction of any of the Teeth

is frequently followed by hæmorrhage, which becomes alarming, from its long continuance; in such cases the coagulum of blood (through which the fresh bleeding appears to ooze) should be entirely removed, and a small piece of sponge of a conical form should be pressed down to the lowest point of the socket, and be retained there for a considerable time; in some cases of this nature, it has been necessary to have recourse to the actual cautery after ordinary stiptics have failed.*

SECOND ORDER.

When the internal Maxillary Artery has entered the space bounded by the muscles before mentioned, it gives off several branches, the principal of which are the following:—

3. Arteriæ pterygoideæ, are fasciculi of small arteries which supply the two Pterygoid muscles.

4. Arteriæ temporales profundæ are two in number, both lie close to the bones composing the Temporal Fossa, one near the root of the Zygoma, the other near the Malar Bone, through which small branches pass into the Orbit, they ascend on the

* In the 8th Vol. of the Medico-Chirurgical Transactions, a case of this kind is related, in which the Carotid Artery was tied, but the hæmorrhage proved fatal.

side of the Cranium, supply the Temporal Muscles, and anastomose with the middle Temporal Arteries.

5. ARTERIÆ MASSETERICÆ are two or three branches which pass outwards in front of the neck of the lower Jaw, and entering the substance of the Masseter Muscle, divide into several branches, which anastomose with the Temporal and Transversalis Faciei Arteries.

6. ARTERIÆ BUCCALES, some of these are long and tortuous vessels, they run on the Buccinator Muscle towards the integuments of the Cheek and angle of the Mouth, and anastomose with the Labial and other arteries of the Face.

7. ARTERIA DENTALIS, VEL MAXILLARIS SUPERIOR, arises near the tuberosity of the superior Maxillary Bone, it runs in a very serpentine manner above the Alveolar Processes of this bone; some branches enter the Antrum, and others perforate the small openings in the Alveoli, and supply the roots of the Teeth; this artery anastomoses very freely with the Infra Orbital Artery.

THIRD ORDER.

THE internal Maxillary having turned downwards and forwards into the Pterygo Maxillary Fossa, divides into three branches, besides giving off some smaller twigs of little importance.

8. ARTERIA INFRA ORBITALIS, in size, appears the continued trunk of the artery, it runs forwards and upwards, enters the Infra Orbital Canal, through which small branches pass into the Orbit to the fat and muscles there, others descend to the Antrum and Alveoli, while the continued trunk accompanies the Infra Orbital Nerve to the Face, where it spreads out into a lash of branches, which anastomose freely with the Labial and Transversalis Faciei Arteries; as this artery escapes from the Infra Orbital Foramen, it is covered by the outer portion of the Levator Labii Superioris Alœque Nasi Muscle, and lies on the Levator Anguli Oris.

9. ARTERIA PALATINA DESCENDENS descends in the Posterior Palatine Canal, divides into two branches, the smaller one passes through the small hole in the Pterygoid Process of the Palate Bone, and is lost in the Velum Palati; the larger branch descends in the canal to the Palate, and runs close to the Palate-plate of the Maxillary Bone inside its Alveolar Arch; this artery supplies the mucous membrane and glands of the Palate, and sends a small branch through the Foramen Incisivum to the Nose, which anastomoses with the Nasal Arteries.

10. ARTERIA NASALIS passes through the Sphenopalatine Foramen into the superior Meatus of the Nose above the posterior extremity of the middle Spongy Bone, it immediately divides into several

branches, two or three pass backwards beneath the body of the Sphenoid Bone to the upper part of the Pharynx, and ramify on its mucous surface, (these Pharyngeal Branches often arise distinctly from the internal Maxillary,) the other branches of the Nasal ramify on the mucous membrane of the Nose; some run across to the Septum Nasi, one of which accompanies the nerve of Cotunnius to the Foramen Incisivum, and anastomoses with the Palatine Artery; the other nasal branches supply the mucous membrane, a small branch is usually sent backwards either from the Nasal or Palatine, to the Vidian Foramen of the Sphenoid Bone, and accompanies the Vidian Nerve; all the nasal and palatine arteries lie close to the bone, or Periosteum, and their minute branches are innumerable; these are very fine and short, and are soon lost in the mucous tissue; they are best displayed by breaking and removing the thin laminæ of bone, and leaving the arteries adhering to the mucous membrane.

ARTERIA CAROTIS INTERNA, VEL PROFUNDA.

In the child this artery is larger than the external Carotid, but in the adult they are nearly of equal size. The internal Carotid Artery ascends in front

of the transverse processes of the three superior Cervical Vertebræ to the base of the Cranium, enters the Foramen Caroticum in the petrous part of the Temporal Bone, winds through an oblique canal in that bone, and through the Cavernous Sinus, then rising by the side of the Sella Turcica, it becomes attached to the base of the Brain, and divides into two large branches to supply the anterior and middle lobes of the Cerebrum. In order to examine this artery more accurately, it may be divided into three portions :—first, The Cervical, which extends from its origin to the base of the Cranium ;—secondly, Its passage through the Temporal Bone and Cavernous Sinus ;—and thirdly, The Cerebral Portion or termination within the Cranium. The internal Carotid Artery, immediately after its origin, swells outwardly towards the side of the Neck, then ascends, inclining inwards and a little forwards, and as it approaches the Foramen in the Temporal Bone, it becomes very tortuous, and is often inflected to either side, so as to form different curves, the direction and extent of which are very irregular. The internal Carotid Artery, in this course, lies, at first, on the Rectus Capitis Anticus Major Muscle, afterwards on the Par Vagum Nerve, and ganglion of the Sympathetic ; the internal Jugular Vein is external and posterior to it, the Lingual Nerve is also external to it, but near the base of the Skull this nerve is behind the artery, for

In passing from the anterior Condyloid Foramen of the Occipital Bone, it runs outwards in front of the vein and behind the artery; the nerve then descends along the external side of these vessels, and opposite to the Os Hyoides it arches across the Neck, superficial to both internal and external Carotid Arteries. The parts anterior to the internal Carotid, are, the external Carotid Artery and its branches, the Styloid Process and Styloid Muscles, also the Digastric Muscle, the Lingual, Glosso-pharyngeal and Facial Nerves, and the Parotid Gland. The internal Carotid Artery is separated from the external, by the Styloid Process, by two of the Styloid Muscles, by the Glosso-pharyngeal Nerve, and by part of the Parotid Gland. The Pharynx is on the internal side of the Carotid, loosely connected to it below, but more closely above; the Tonsil also is internal, and a little anterior to this artery, united to it in health only by loose cellular membrane, but in cases of suppurative inflammation of this gland, it becomes so closely connected not only to this artery, but also to the external Carotid and Facial Arteries, that in opening an abscess in this gland in an incautious manner, there is considerable danger of wounding some of these vessels; the Student should, therefore, particularly examine the situation and connexion of the Tonsil; if a vertical section of the Head have been made, as was before directed, in

order to expose the internal Maxillary Artery, he may obtain a good view of the relations of this oval body; he will find that the Tonsil is placed in a recess between the arches of the Palate; that the Palato Glossus Muscle is anterior to it, and the Palato Pharyngeus Muscle is behind it; that it is covered externally by the superior Constrictor and Stylo-glossus Muscles, and by a quantity of cellular and adipose membrane, which leads towards the angle of the Jaw, from which the lower extremity of this gland is somewhat less than an inch distant. In Cynanche Tonsillaris there is, in general, considerable swelling of the Tonsil and surrounding cellular membrane; the gland enlarges, first, in a direction inwards, so as to meet the opposite Tonsil, it then extends itself backwards towards the vertebræ, and downwards and outwards towards the angle of the Jaw, beneath which a fulness is perceptible, and acute pain is felt on pressure, or on any attempt to swallow; when the Tonsil is thus enlarged, it will be found in close apposition to some of the principal vessels of the Neck; namely, to the internal Carotid Artery and Jugular Vein posteriorly, to the superficial Carotid externally, and to the Facial Artery anteriorly and inferiorly; the small vessels which supply the gland itself will be found increased in number and size. In opening an abscess in the Tonsil, the Surgeon should particularly recollect the proximity of the

Carotid Arteries, and avoid directing the lancet or trochar either outwards or backwards, but rather inwards, towards the Pharynx; a small opening will, in general, be sufficient, and will be found preferable to a large one, for through the former the matter will escape gradually, and by the efforts of the patient, whereas, if a free incision be made, he may be suffocated by the sudden discharge of pus and blood descending into the Throat.

The cervical portion of the internal Carotid gives off no regular branch; sometimes the Pharyngea Ascendens arises from it; of this, however, I have seen but one instance.

Posterior to the Eustachian Tube and Levator Palati Muscle, the internal Carotid Artery enters the Foramen Caroticum, and pursues its serpentine course through the canal in the Petrous Bone and Cavernous Sinus; to expose this middle division of the artery, the Student should remove the lower Jaw, the Styloid Process and Styloid Muscles, also the Parotid Gland, then cut out a triangular piece of the Temporal and Sphenoid Bones with the saw, by directing the edge of this instrument inwards and forwards through the side of the Cranium, and through the anterior part of the Meatus Auditorius Externus towards the Foramen Lacerum Anterius, and then meet the internal extremity of this incision by another, which should be directed inwards and

backwards through the great wing of the Sphenoid Bone towards its Spinous Process; a slight blow will detach this triangular piece of bone, and lay open the Carotid Canal, in which the artery is observed to run in a remarkably tortuous manner; it first ascends, then turns forwards, then upwards and inwards towards the Sella Turcica, and lastly, it ascends inclining a little backwards; its course through this canal somewhat resembles the figure of an Italic *f* placed horizontally, but is much more tortuous. In this course the artery lies at first anterior to the Tympanum, from the cavity of which it is only separated by a thin transparent plate of bone, which in the very young subject is cribriform, and in the very old, is sometimes absorbed: as the artery runs forwards, it lies inferior and external to the bony case of the Cochlea, and inferior to the Eustachian Canal, above which, however, it gradually rises, and at the Foramen Lacerum Anterius, a firm gristly substance separates these two; the proximity of this large artery to the parts concerned in the function of hearing, may account for the great and sensible effects which are produced upon this delicate organ, by the preternatural or morbid action of the arterial system.

In cases of fractures of the Cranium, which traverse its base, the petrous portion of the Temporal Bone is generally cracked, and there is bleeding from the external Ear; does this proceed from a

rupture of small vessels only, or is the trunk of this artery ever injured? My own experience does not enable me to decide: in some cases, the blood flows very freely, and for a considerable time, whereas, in others, the hæmorrhage is very slight, and the discharge is principally serum. In one case of extensive fracture of the base of the Cranium, in which there was bleeding from the Ear, and which I had an opportunity of examining after death, I found that the blood proceeded from the Lateral Sinus; the fracture had extended through the petrous and mastoid portions of the Temporal Bone, and a small probe could be passed from the Tympanum into the Lateral Sinus; the internal layer, however, of the Dura Mater was not injured, and consequently there was no extravasation of blood between this membrane and the Brain.

As the Carotid Artery passes through this canal, it is accompanied by two or more branches from the superior Cervical Ganglion of the Sympathetic Nerve; these lie on the posterior and external side of the artery; they have a reddish appearance; at first view, they are rather indistinct, but when carefully examined, particularly if first immersed for a short time in Alcohol, they become very evident; they form a plexus round the artery; the branches of this plexus are soft and broad, and may be traced for some distance on the divisions of the Carotid,

and on the Ophthalmic Artery. This portion of the internal Carotid Artery appears to have a greater number of nerves, and these of a larger size, than any other part of the arterial system: in several situations, however, we find that the external coat of arteries is freely supplied with nerves which are principally derived from the sympathetic or ganglionic system; thus the Aorta and Pulmonary Artery, at their origin, are surrounded by branches from the Cardiac Plexus; these are very pale and soft; the branches of the external Carotid also are each enveloped by a plexus of nerves from the Sympathetic, branches of which may be traced on the coats of these vessels to a considerable distance; in like manner, the Coronary Arteries of the Heart, the Spermatic Arteries, and those of the Abdominal Viscera, are each surrounded by a plexus of nerves, branches from which twine around these vessels and their ramifications. The arteries of the extremities have not so many or such large nerves for their supply, as those blood-vessels that are destined to nourish organs which have particular functions to perform, or parts which possess a peculiar or a high degree of sensibility. When the nerves that form this plexus around the internal Carotid Artery, are traced as far as the Cavernous Sinus, they may be observed to pass off in different directions, and to unite with several of the Cerebral Nerves; two branches ascend to join the sixth pair

of nerves in the Cavernous Sinus, a slight expansion, like a ganglion, marks the situation of their union on the external side of the Carotid Artery; the Abducens Nerve is larger from this point to the Orbit, than it was previous to this connexion with the Sympathetic; other branches of this plexus pass outwardly, and join the ganglion or plexus of the fifth pair, particularly the ophthalmic division of it; one branch of it may be observed to join the nasal twig of the Opthalmic, and may be traced to the Lenticular or Opthalmic Ganglion, in which it joins a branch from the third pair of nerves; a small branch from the Carotid Plexus may be traced forwards through the Vidian Foramen of the Sphenoid Bone to the Pterygo-maxillary Fossa, where it joins the Ganglion of Meckel, branches from which twine round the internal Maxillary Artery; another branch of the Carotid Plexus passes backwards, and enters the Vidian Foramen of the Temporal Bone, attaches itself to the side of the Portio Dura, crosses the cavity of the Tympanum, under the name of Chorda Tympani, and escaping through the fissure in the glenoid cavity of the Temporal Bone, joins the Lingual Branch of the inferior Maxillary Nerve; other branches of the Carotid Plexus may be traced along the Opthalmic Artery, a minute twig also may be seen uniting with the Trochleator Nerve, and the

remaining filaments ascend on the Carotid Artery and its ultimate branches. Thus may a communication be shown to exist between the Sympathetic Nerve and most of the Cerebral Nerves; in the Neck, branches from the superior Cervical Ganglion are interwoven with branches from the seventh, eighth, and ninth pair, and in the Carotid Canal the branches of the Carotid Plexus serve to connect the Sympathetic with the third, fourth, fifth, and sixth pair of nerves; the branches of this plexus also serve to connect the several ganglions of the Head to the Sympathetic Nerve or Ganglionic System: I am also disposed to think, that a somewhat similar connexion exists between this system and the several ganglions of the Spinal Nerves.

The Carotid Artery, in its passage through the Cavernous Sinus, is commonly described as "being bathed in the blood of that sinus;" it is, however, separated from the fluid in this cavity by a fine membrane. The Cavernous Sinus extends from the side of the body of the Sphenoid Bone to the anterior

* I have given a more full description of these nerves than may appear necessary in a work of this kind; but as I presume the Student has made the dissection, as directed, to expose the Carotid Artery, I think he may take this opportunity of examining these branches of the Sympathetic, most of which can be seen in this dissection with very little additional trouble.

extremity of the Petrous Bone; its parietes, like those of other sinuses, are formed by the Dura Mater, dividing into two laminæ, of which the superior layer is the stronger, and forms the roof of this sinus; the inferior layer is thin, and adheres, like Periosteum, to the surface of the bones; similar to other sinuses, this also is lined by a fine membrane continued from the Ophthalmic Vein anteriorly, and the Petrous Sinuses posteriorly; the interior of this sinus has a cellular appearance, not unlike the Corpus Cavernosum Penis, hence it has received the name of Cavernous Sinus; this cellular appearance is principally caused by small branches of the Carotid Artery, and of the Carotid Plexus of nerves, crossing the cavity in different directions. As the Carotid Artery, sixth pair of nerves, and branches of the Sympathetic, perforate the fibrous wall of this sinus, its lining membrane is reflected from the edges of these different openings, on this vessel, and on these nerves, and, covering them, completely separates them from the blood contained in the sinus: in a recent subject, this membrane can be seen distinctly, or, if the artery be much curved, as Bichat has accurately remarked, this fine transparent membrane is very obvious, as it is extended from one convolution of the artery to another.

As the Carotid Artery winds through the Temporal Bone, it gives off one or two small branches

to the Tympanum; in the Carvernous Sinus also, it gives off two or more branches, called,

1, 2. ARTERIÆ RECEPTACULI. These, interlace with branches of the Sympathetic Nerve, supply the Dura Mater in this region, and some pass outwardly to the ganglion of the fifth pair of nerves, and anastomose with the middle artery of the Dura Mater.

At the side of the Sella Turcica, the Carotid Artery perforates the Dura Mater, and now commences its cerebral division. As this part of the Carotid ascends, it inclines backwards, presenting a convexity towards the Orbit; the Arachnoid, or serous membrane, is reflected round it to the inferior surface of the Brain, and at the internal extremity of the fissure of the Sylvius, the artery divides into its terminating branches. In this situation, the Carotid Artery has the Optic Nerve on its internal, and the Motor Oculi Nerve on its external side; the fourth, fifth, and sixth pair of nerves are also external to it, but they are at a greater distance from the vessel; the proximity of this large artery to these two principal nerves of the Organ of Vision, (one of which is to become the very seat of that sense, and the other to supply so many of its appendages,) may explain how some derangements of this organ may depend on an altered condition of this vessel, either from temporary excitement, or permanent disease. As the Carotid Artery is emerging from the Cavernous Sinus, it sends off—

3. ARTERIA OPHTHALMICA. This artery enters the Orbit by the Foramen Opticum, and is destined to supply the Eye and its appendages, as well as a part of the integuments and muscles of the Forehead. To trace the ramifications of this artery, the roof of the Orbit must be raised; when the Calvarium has been removed, this may be done by two cuts with a saw, which should unite in the Foramen Lacerum a little to the outside of the Foramen Opticum; the external incision should divide the Os Frontis through its external angular process, and the internal incision should divide this bone on the outside of its internal angular process; the roof of the Orbit may then be everted, and thrown forward, the Dura Mater adheres so closely to the Periosteum, that this membrane is always detached from the bone in opening the Orbit in this manner. The small branches of the Ophthalmic Artery are seldom filled when the arterial system has been injected from the Heart with the coarse red injection. If the Student, however, wishes to trace its minute branches, let him insert a small pipe into the artery itself at its origin, and immersing the Orbit and surrounding parts in warm water, inject some fine size injection; in this way, all its branches, even those of the Iris and Choroid Coat, may be filled.

The Ophthalmic Artery runs forwards through the Optic Foramen, enclosed in a small canal or sheath

derived from the Dura Mater; it is a very tortuous artery, and completely twines round the Optic Nerve, being at first inferior to this nerve; then running along its outer side, and soon rising over it, crosses to its internal side, and then passes horizontally forwards along the inner wall of the Orbit, to the side of the Nose, where it divides into ascending and descending branches. The Ophthalmic Artery is less remarkable for its size than for the number of its branches; these may be arranged into three orders, according to the situation of the trunk of the artery; the first arises from the Ophthalmic Artery external to the Optic Nerve; this consists of the Lachrymal and Centralis Retinæ; the second arises from the Ophthalmic, above the Optic Nerve; this consists of the Supra Orbital, Ciliary, and Muscular; and the third set arises from the Ophthalmic at the nasal side of the Orbit, and consists of the Ethmoidal, Palpebral, Nasal, and Frontal Arteries.

1. ARTERIA LACHRYMALIS is one of the largest branches of the Ophthalmic Artery; it arises close to the Foramen Opticum, and sometimes before the Ophthalmic Artery has entered the Orbit; the Lachrymal Artery runs along the upper edge of the Abductor Oculi Muscle, gives small branches to it, sends one or two through the Malar Bone to anastomose with the deep Temporal Arteries; it then runs to the upper surface of the Lachrymal Gland,

and divides into several small branches, which enter its substance; one or two are also sent to the superior and inferior Palpebræ, and anastomose with the proper Palpebral Arteries. There are frequently two Lachrymal Arteries, and sometimes the middle artery of the Dura Mater sends a branch through the lacerated opening in the Orbit to the Lachrymal Gland.

2. ARTERIA CENTRALIS RETINÆ is one of the smallest branches of the Ophthalmic Artery; it arises near the Foramen Opticum, penetrates the Optic Nerve, runs in its centre, and having arrived at the posterior part of the Vitreous Humour, it divides into a number of small branches, which are connected together by a fine cellular tissue, and assist in forming the internal layer of the Retina, external to which is its peculiar Medullary Matter; a branch of this artery also penetrates the Vitreous Humour, supplies the Hyaloid Membrane, and in a successful injection may be traced to the Capsule of the Crystalline Lens. When the Optic Nerve is divided, a small dark speck is observed on each cut surface; this is the divided artery, and has been named the Porus Opticus. The Hyaloid Branch, which penetrates the Vitreous Humour, is very distinct in the eye of the sheep or ox, or in a very fresh human eye. The Arteria Centralis Retinæ sometimes arises from some of the branches of the Ophthalmic, and not from its trunk.

3. ARTERIA SUPRA ORBITALIS arises from the Ophthalmic Artery above the Optic Nerve, and is usually its largest branch; it first ascends, so as to rise above all the muscles in the Orbit, and to lie close to the Periosteum; it accompanies the Frontal Nerve, and runs forwards to the Superciliary Notch or Foramen, where it often appears larger than at its origin; it then turns round the Superciliary Arch, and spreads its branches on the Forehead; this artery, in the Orbit, supplies the Levator Oculi, and Levator Palpebræ Muscles; near the base of the Orbit, it sends a branch towards the Trochlea of the Oblique Muscle; this gives small branches to the parts at the inner canthus of the Eye, and to the superior Palpebra; as the Supra Orbital Artery passes through the Superciliary Notch, it sends a branch into the Diploe of the Os Frontis, and then ascending on the Forehead, it divides into several branches, some of which run inwards towards the Nose, and anastomose with the angular branch of the Facial Artery, and with arteries from the opposite side; others ascend on the Forehead to supply the Integuments, and Occipito Frontalis Muscle, and anastomose with the Temporal Artery; some of these branches are very large, and will occasionally afford blood when opened for inflammatory affections of the Eye. The trunk of the Supra Orbital Artery, although near the surface, ought never be selected

for Arteriotomy, as not only must the Orbicularis Palpebrarum and Occipito-frontalis Muscles be wounded, but also the Frontal Nerve; and repeated instances have occurred of wounds of this nerve producing unpleasant consequences either to some of the muscles of the Eye, or to vision itself. If a line be dropped perpendicularly from the Superciliary Notch to the side of the lower Jaw, it will correspond to three foramina, viz. the Supra Orbital, Infra Orbital, and Mental, through each of which pass an artery and a branch of the fifth pair of nerves.

4. ARTERIÆ CILIARES. These are fasciculi of small arteries which are remarkably tortuous, and are accompanied by delicate nerves of the same name; they have no regular or exact origin, most of them arise from the trunk of the Ophthalmic, but frequently some arise from the Ethmoidal, Supra Orbital, or from some muscular branches; they are at first about eight or ten in number, some twine round the Optic Nerve in a spiral manner, they soon subdivide and inosculate with each other, and having arrived at the Sclerotic Coat, they appear much more numerous, even fifteen or twenty may be easily perceived; at about two lines, or rather less, anterior to the entrance of the Optic Nerve, these arteries penetrate the Sclerotic, most of them terminate in the Choroid Coat, and are named the short Ciliary Arteries, while on either side one branch is observed

to continue its course onwards, passing horizontally between the Sclerotic and Choroid Membranes as far as the Ciliary Body; these are named the Long Ciliary Arteries, they are parallel to the long axis of the Eye, and are accompanied by nerves of the same name. At the Ciliary Body each of these arteries divides into two branches, which, passing through the Ciliary Ligament, subdivide, and by numerous inosculations with each other, and with small arteries which perforate the Sclerotic near the Cornea, form a perfect circle of blood-vessels at the circumference of the Iris; from this circle proceed branches like rays towards a centre, which, subdividing and anastomosing, form a complicated kind of net-work, or a second circle within the former; and from the concavity of this proceed small branches, which run and subdivide in the same manner, and uniting again, form another circle smaller than either of the former, and very near to the opening of the Pupil. The long Ciliary Arteries generally arise more regularly from the trunk of the Ophthalmic than the short ones, and the latter perforate the Sclerotic, nearer the Optic Nerve than the former. In a successful injection, the Choroid Coat appears entirely composed of vessels like the villous surface of the Stomach or Intestines; in a state of health, however, these numerous vessels do not transmit red blood. The situation of the long Ciliary Arteries and Nerves should be re-

membered in the operation of couching or depression of the Cataract; to avoid injuring these, the needle must be introduced about two lines below the horizontal diameter of the Eye.

In addition to the long and short Ciliary Arteries, the Choroid Coat and Iris receive small vessels from the muscular branches of the Ophthalmic; these are named by some Authors, the anterior Ciliary Arteries, they perforate the Sclerotic, about one or two lines behind the Cornea; some branches go to the Iris, and anastomose with the long Ciliary Arteries, others go to the Choroid Coat, and communicate with the short Ciliary; numerous arteries from all these enter the Ciliary Processes and Iris. The particular arrangement of these Arteries has been matter of dispute among anatomists, and deserves to be more particularly considered in the minute examination of the organ of vision, than in a description of the general arterial system; I may, however, here observe, that I have remarked the posterior surface of the Iris to be much more vascular than the anterior, the fibrous and fasciculated appearance of which appears to me to be independent of vascular arrangement.

5. RAMI MUSCULARES. These are uncertain in number and origin; the superior branches often arise from the Supra Orbital Artery, supply the Levator Palpebra, and Levator Oculi Muscles; the inferior Muscular Artery descends on the inner side

of the Optic Nerve, first sends a considerable branch to the external Rectus, and then supplies the inferior Rectus and inferior Oblique Muscles, it also sends small branches to the fat in the Orbit; these anastomose with the Infra-orbital from the internal Maxillary, some branches also pass to the inferior Eyelid and Lachrymal Sac; these muscular branches, in general, accompany the branches of the third pair of nerves, and are distributed to the optic surface of each muscle as the nerves are; this rule, however, is not so regular, with regard to the arteries, as it is in respect to the nerves, all of which, except the fourth pair, enter the optic surfaces of the muscles.

6. ARTERIA ETHMOIDALIS, arises from the Ophthalmic Artery on the inner side of the Optic Nerve, passes through the Foramen Orbitarium Internum Posterius, crosses the cribriform lamella of the Ethmoid Bone, and supplies the ethmoid cells and the mucous membrane of the Nose, on which its branches anastomose very freely with the proper nasal arteries from the internal Maxillary; a small branch from the Ophthalmic also passes through the Foramen Orbitarium Internum Anterius, and is distributed to the Nose in the same manner as the last described branch.

7, 8. ARTERIA PALPEBRALIS, SUPERIOR ET INFERIOR. These arteries arise near the inner angle of the Orbit; the superior arises imme-

diately above the tendon of the Orbicularis-palpebrarum, runs outwards, and divides into branches to supply the superior Palpebra; a small branch runs near the orbital edge of the Tarsal Cartilage, and supplies the Meibomian Glands, and the other branches are distributed to the muscles and integuments of the Eyelid, and anastomose with the Supra-orbital Artery. The inferior Palpebral descends behind the tendon of the Orbicularis Muscle on the outer side of the Lachrymal Sac, gives branches to it and to the fibres of the Orbicular Muscle, then passes outwards and divides into branches for the lower Palpebra, which run in the same manner as those of the superior; these anastomose with the Angular, Infra Orbital, and Temporal Arteries. These Palpebral Arteries supply also the Conjunctiva, lining the Eyelids and covering the Eye; it is from branches of these vessels that blood sometimes flows very freely from scarifications made on the internal surface of the Eyelids; from the course and situation of these arteries, it is obvious, that these incisions should be made posterior to the Meibomian Glands, so as not unnecessarily to injure these small organs or their excretory ducts.

9. ARTERIA NASALIS is one of the terminating branches of the Ophthalmic Artery; it passes out of the Orbit between the trochlea of the Oblique Muscle and the tendon of the Orbicularis, and descends

along the side of the Nose; this artery sends branches to the Lachrymal Sac and inferior Palpebra, and anastomoses with the angular branch of the Facial Artery.

10. ARTERIA FRONTALIS is the last branch of the Ophthalmic Artery; it passes out of the Orbit along with the nasal branch, but takes a different direction; the Frontal Artery turns upwards on the Forehead, divides into several branches, which supply the Occipito-frontalis and Corrugator-supercilii Muscles, and anastomose with the Supra-orbital Artery and with arteries from the opposite side.

The Student should next proceed to trace the branches which the internal Carotid Artery gives to the Brain. The most satisfactory view of these arteries, and of their natural relations to the different parts at the base of this organ, may be obtained by examining them when the whole Brain is removed from the Cranium, together with the different arteries that supply it; first cutting across each internal Carotid after it has given off the Ophthalmic Artery, and then dividing the vertebral arteries in the Foramen Magnum, and each of the nerves at their exit from the Cranium, in the ordinary way of removing the Brain for the purpose of dissection.

Each internal Carotid Artery divides at the base of the Brain into three branches, named, Arteria Communicans Posterior, Arteria Cerebri Anterior, and Arteria Cerebri Media; the first-mentioned branch

is the smallest, the last is the largest of the three. When the Student has exposed these branches of the Carotid Artery, he had better refer to the description of the Basilar Artery, which is formed by the union of the vertebral arteries, and thus take a connected view of the cerebral vessels. The internal Carotid, after giving off the Ophthalmic Artery, sends backwards the following branches :—

4. ARTERIA POSTERIOR COMMUNICANS: this is a small but a remarkable artery; it is about an inch in length; it runs backwards and inwards between the Arachnoid Membrane and the Pia Mater on the external side of the Infundibulum and Corpora Mammillaria, and joins the Posterior Cerebral Artery, a branch of the Basilar, at the anterior edge of the Pons Varolii; thus this artery serves as a means of communication between the Carotid and Basilar Arteries, and so assists in forming the circle of Willis : in this short course, this artery gives off several small branches to the Pia Mater; there is a plexus of minute arteries between the Optic Nerve and Pons Varolii beneath the third Ventricle; this plexus is formed by branches from the Posterior Communicating Arteries, and from the Carotid and Basilar arteries. The communicating arteries of opposite sides are nearly parallel to the third pair of nerves.

The internal Carotid immediately after giving off

the last described artery, divides into its two terminating branches.

5. ARTERIA CEREBRI ANTERIOR passes upwards, forwards, and inwards, towards the fissure between the anterior lobes of the Cerebrum; this artery separates the Optic from the Olfactory Nerves, lying above the former, and below the latter; when it enters the fissure between the anterior lobes, it approaches the artery of the opposite side, to which it is united by a short transverse branch, called "Arteria Communicans Anterior;" sometimes the arteries of opposite sides unite, and form a single trunk, which, after a very short distance, divides into two branches, which pursue the proper course of the original arteries: the anterior Cerebral Artery then runs horizontally forwards beneath the Corpus Callosum, round the anterior extremity of which it turns upwards and backwards, and then runs along its upper surface, and soon divides into two branches, the inferior of which continues to run on the Corpus Callosum as far as its posterior extremity, where it terminates in branches which go to the internal side of each hemisphere of the Cerebrum. The superior branch ascends from the Corpus Callosum, and is distributed to the internal surface of each hemisphere; this artery makes a remarkable curvature round the Corpus Callosum, first from behind forwards, then from below upwards, and, lastly, from before back-

wards; at first it only gives a few small branches to the base of the Brain, but to the hemispheres it sends very long and tortuous arteries, which ramify on the Pia Mater very minutely before they enter the substance of the Brain; these arteries supply principally the internal surface of the anterior and middle lobes of the Cerebrum, a few branches only go to the posterior lobes.

6. ARTERIA CEREBRI MEDIA is much larger than the artery last described, and is remarkably tortuous, it bends outwards and backwards, sinks into the fissure of Sylvius, runs upwards and outwards, and divides into a superficial and a deep branch, both of which give numerous branches to the Pia Mater on the anterior and middle lobes of the Cerebrum, but chiefly to the latter. Before this artery enters the fissure, it sends a few branches to the Pia Mater at the base of the Brain, and almost always sends a branch called, "Choroid Artery," which enters the inferior cornu of the Lateral Ventricle by a fissure between the Optic Thalamus and Hippocampus Major: this artery then runs into the Choroid Plexus, and ramifies through its delicate tissue; the Choroid Artery sometimes arises from the Posterior Communicating Artery, or from the Carotid itself; sometimes a fasciculus of small branches enters each Lateral Ventricle by this fissure in its inferior Cornu.

ARTERIÆ SUBCLAVIÆ.

THE Subclavian Arteries are two in number, the the right arising from the Arteria Innominata, the left from the posterior part of the arch of the Aorta; in magnitude, these vessels equal the Carotid Arteries; their branches are distributed to the Neck and Brain, to the parietes of the Thorax, to the muscles of the Shoulders, and to the superior extremities. These trunks, successively denominated, according to the regions through which they pass, Subclavian, Axillary, and Brachial, continue to run in an undivided course as far as the Elbow, where, from their first subdivision, arise the Radial and Ulnar Arteries; these arteries derive their names from running parallel to the Radius and Ulna, and terminate in a free inosculation with each other in the palm of the Hand. These divisions, though arbitrary, are found useful and convenient, and have been adopted by anatomists and pathologists for the purpose of more accurately examining the relation of the artery in different situations, as well as of describing the extent and form of any disease with which it may be affected. We commonly designate by the name of Subclavian, that portion of the artery which

extends from its origin, beneath the Clavicle, as far as the inferior border of the first Rib; beyond this the continuation of the same vessel assumes the name of Axillary Artery, which name it retains until it reaches the tendons of the Latissimus Dorsi and Teres Major Muscles; and from the inferior margin of these, until it arrives at the bend of the Elbow, it receives the name of Brachial or Humeral Artery. The right and left Subclavian Arteries differ from each other only as to their origin, and in the first part of their course; to this difference between these two arteries, I shall particularly allude in the following description. In the number of branches, however, and in their termination, they agree so accurately, that one description may apply to both. I should recommend the Student first to trace the right Subclavian Artery.

ARTERIA SUBCLAVIA DEXTRA.

To expose this vessel, the Sterno Mastoid, Hyoid, and Thyroid Muscles, should be divided about the centre of the Neck, and thrown downwards over the Clavicle and Sternum: I prefer dividing the muscles in this situation, to detaching them from the Sternum, as by the former method the Student can replace them at pleasure, and so review the relations of the

artery with more advantage: when the muscles are thus displaced, the deep Cervical Fascia divided, and a quantity of cellular and adipose membrane removed, the origin and course of the right Subclavian Artery is brought into view.

This artery arises from the Arteria Innominata, opposite the Sterno Clavicular Articulation, passes upwards and outwards to the anterior Scalenus Muscle, behind which it runs; it then inclines downwards and outwards to the Clavicle and Subclavian Muscle, under which it descends to the Axilla; in this short course it forms an arch, the convexity of which is upwards, and from which several large branches arise; the concavity of this arch looks downwards to the right Lung. For the purpose of more accurately examining the relation of this vessel to the surrounding parts, the Student may divide its course into three stages; the first extends from the origin of the artery, to the tracheal edge of the Scalenus Muscle; the second, or middle stage, is the transit of the artery between the Scaleni Muscles; and the third stage extends from these muscles, beneath the Clavicle, to the lower border of the first Rib; in these two latter stages, the right and left Subclavian Arteries are similar, but differ essentially in the first. The right Subclavian Artery, in the first stage of its course, runs outwards, inclining a little upwards, and is covered by the integuments and Cervical

Fascia, by the clavicular portion of the Sterno-mastoid Muscle, beneath which is a considerable quantity of loose cellular membrane and several small arteries and veins; it is also covered by the Sterno-hyoid and thyroid Muscles, and by a dense fascia, which is continued from the Arteria Innominata to the anterior Scalenus Muscle. When these parts are removed, a small triangular space between the Carotid Artery and Jugular Vein is brought into view, the base of which space is formed by the Subclavian Artery, and here the Nervus Vagus may be seen crossing that artery at right angles; behind the Jugular Vein the anterior branches of the inferior cervical ganglion of the Sympathetic Nerve descend in front of the Subclavian Artery, and external to these is the Phrenic Nerve running in the same direction. Thus, in the first part of its course, the right Subclavian Artery is covered by three layers of muscles, by the Vagus Nerve, by the internal Jugular and Vertebral Veins, and by branches of the Sympathetic Nerve. The right Subclavian Artery in this stage has the recurrent Laryngeal Nerve posterior to it, also some cellular membrane and lymphatic glands, which separate it from the Vertebræ and Longus Colli Muscle; it then passes in front of the Sympathetic Nerve, and lies upon the Pleura.

The right Subclavian Artery, in the middle di-

vision of its course, lies on the Pleura and middle Scalenus Muscle, is accompanied by the brachial plexus of nerves, and is covered by the Sterno-mastoid and anterior Scalenus Muscles; the Phrenic Nerve and Subclavian Vein are also anterior to it, but are separated from the artery by the anterior Scalenus Muscle.

The Subclavian Artery, in the third part of its course, inclines downwards and outwards, and is covered only by the integuments, platisma, cervical fascia, and cellular membrane, the quantity and consistence of which vary much in different subjects. In this stage the artery lies on the middle Scalenus Muscle, and on the superior surface of the first Rib; this bone is in general found grooved in the part corresponding to the artery; the brachial plexus of nerves and the Omo-hyoid Muscle are to its superior and acromial side; the Subclavian Vein is anterior and inferior to the artery, and is partly concealed by the Clavicle. The external Jugular Vein and some branches from the Shoulder and side of the Neck join the Subclavian Vein in this situation, and in some subjects obscure the view of the artery very much. The position of the Clavicle has great influence on the relative distance of the Subclavian Artery from the surface of the Neck; if the Shoulder be elevated and drawn forwards, a small portion only of the artery can be seen, and that at a great

depth from the integuments; whereas, if the Shoulder be depressed and directed backwards, the artery will appear much more superficial, and will be exposed through the whole of its third stage. When the Shoulder is in this depressed position, a triangular space may be observed above the Clavicle, between the Sterno-mastoid and Trapezius Muscles; within this is a smaller space, which is bounded externally by the Omo-hyoid Muscle, anteriorly by the Sterno-mastoid and Scalenus Muscles, and inferiorly by the Clavicle and Subclavian Muscle; through this small space pass the brachial plexus of nerves, and the Subclavian Artery and Vein; the nerves lie superior and external, the vein inferior and anterior to the artery, and one branch of the plexus of nerves inclines to the front of the artery near the lower part of this region. Besides the several veins which are to be seen here, two arteries of very considerable size may be generally observed passing across this space, namely, the Supra-scapular and Transversalis Colli; the former is very near, and parallel to the Subclavian Muscle, the latter crosses this space higher up, near its apex. From an attentive observation of the alteration that may be effected in this space, by the change of the position of the Clavicle, the Student may deduce some practical inferences, to which I shall allude when speaking of the operations that

may be performed on the Subclavian Artery; but first let the Student examine this artery on the left side.

ARTERIA SUBCLAVIA SINISTRA.

To expose this vessel, the superficial muscles of the Neck should be divided, as before directed, the sternal end of the Clavicle dislocated, and the cartilages of the first and second Ribs removed, together with the Sternum; the left Pleura also must be detached from the Aorta, and pressed towards the left Lung. The left Subclavian Artery arises from the posterior or descending part of the arch of the Aorta, opposite the second dorsal Vertebra, and ascends perpendicularly out of the Thorax, as high as the inner edge of the first Rib; it then, like the artery on the right side, passes outwards between the Scaleni Muscles, and pursues its course beneath the Clavicle towards the Axilla. The left Subclavian Artery, from its origin to the Scalenus Muscle, has posterior to it, and in contact with it, the Vertebræ, the Longus Colli Muscle, and the inferior cervical ganglion of the Sympathetic Nerve, and ascends along the left side of the Œsophagus. Anterior to this artery, are the left Lung and Pleura, the Nervus Vagus and left Carotid Artery, the Thoracic Duct, left Jugular

Vein and Vena Innominata, the Sterno-mastoid, hyoid, and thyroid Muscles, also the Sternum, first Rib, and Clavicle.

If the Student now contrast the right and left Subclavian Arteries, he will observe the differences which exist between them in the first stages of their course; the left Subclavian is longer, though in general smaller than the right, arises from the Aorta near the Vertebræ, lies deep in the Thorax, and ascends from this cavity in an almost perpendicular direction; while the right Subclavian arises in the Neck from the Arteria Innominata, is much more superficial than the left, and runs almost transversely to the Scaleni Muscles: the left Subclavian is connected to the Pleura through the entire of its first division; the Vagus Nerve and left Carotid Artery are parallel and anterior to it, whereas, on the right side, the artery has no connexion to the Pleura until it approaches the Scaleni Muscles, and the Vagus crosses it at right angles. The relation of the Venæ Innominatæ to these arteries, differs on the right and left sides, the vein covering the artery more on the latter than on the former; the left Subclavian Artery also is exclusively connected to the Œsophagus and Thoracic Duct. The left Subclavian Artery, in its middle and last stages, is in every respect similar to the right.

Before the Student proceed to dissect the branches of the Subclavian Arteries, he should consider what practical inferences may be deduced from the view he has now obtained of these vessels. From this view, he may learn in what situation compression can be made on the Subclavian Artery, so as to command the circulation in the superior extremity, in cases of operations about the Shoulder, in the Axilla, or on the upper part of the Arm; from the dissection which he has made, he may perceive, that in one situation only can compression be effectually applied, and that is while the artery is descending from the Scaleni Muscles to the inferior margin of the first Rib; if in a living person the Shoulder be depressed, and the Surgeon grasp the side of the Neck, he may press his thumb into the hollow behind the Clavicle, between the Trapezius and Mastoid Muscles, so firmly as to obliterate the canal of the artery against the first Rib; if the Shoulder be not sufficiently depressed, it will be difficult to compress the vessel against that bone, but by making pressure in the same situation, and directing it a little backwards, the artery may be compressed against the transverse process of the last Cervical Vertebra.

Mr. John Bell, in the 2nd vol. of his Anatomy, states, that it is impossible to compress this artery above the Clavicle, but that there is no difficulty in

effecting it below that bone: at page 269, he says, "The old story of compressing the Subclavian Artery "above the Clavicle, is now of no credit with any "Surgeon of knowledge or good sense; the arch is "so deep, and the muscles so strong, it is absolutely "impossible. It passes out from under the arch of "the Clavicle, where it was protected, inclines out-"wards towards the Axilla, lies flat on the convexity "of the Chest, is covered by the Pectoral Muscles, "but can here be felt beating, and at this point only "can be rightly compressed."

Should any disease exist in the Axilla, which may cause the elevation of the Clavicle, and prevent its being depressed, I believe it may be then impracticable to compress the artery above this bone; but, under any circumstances, I consider it almost impossible to make effectual compression upon this artery below the Clavicle; to effect it, the Pectoral Muscles must be put in a relaxed position, which will be found very unfavourable to any operation on the upper or inner part of the Arm, or in the Axilla. I should feel great diffidence in expressing my dissent from any opinion urged by a writer of such celebrity as Mr. Bell, were I not perfectly satisfied, that every operating Surgeon of the present day, is impressed with the truth of the contrary fact, and has learned from observation and experience, not only the possibility, but even the

facility with which the Subclavian Arteries may be compressed above the Clavicle.

The Student should next consider the operation of tying the Subclavian Artery, and by reviewing the parts exposed in the dissection which he has made, he may learn in what situation a ligature may be most easily passed around that vessel, in the living subject, and what parts are in danger of being injured in the operation. The Surgeon may be required to tie the Subclavian in cases of wounds of the Axillary Artery, or, in cases of Aneurism, immediately below or behind the Clavicle; in such cases, the Surgeon has no alternative between attempting this operation and abandoning his patient.

As yet, the records of Surgery do not furnish many cases of success attending this operation; they are, however, sufficiently numerous and satisfactory to prove, not only the practicability of the operation, but also its expediency in many cases of Aneurism, in which an operation is not contra-indicated by constitutional complaints, or rendered impracticable by those local obstacles, which in some cases have proved insurmountable, and which have been caused by the displacement or altered relation of different parts, in consequence of the long continuance or rapid extension of the disease.

From such accounts, however, one conclusion is obvious, and must occur to the mind of every

Surgeon, namely, that the operation ought not to be delayed, and that as soon as he sees that the disease is fully established, and that it is increasing, he should recollect that delay is dangerous, and that if the operation be performed early, there is no peculiar reason to dread an unfavourable issue. Repeated* instances of obliteration of the Subclavian Artery during life, have proved, that collateral circulation can be fully established by the numerous anastomoses that exist around the Shoulder; and the experiment in the dead subject of injecting the superior extremity, after the main artery has been tied, fully demonstrates so free a communication between the vessels of the Neck and Arm, that all apprehension of gangrene from a want of blood, may be now dismissed. Neither are there any local circumstances in the relations of this artery, or in the manner of its branching, which can lead us to suspect that the application of a ligature around it should cause the sloughing or ulceration of its coats more certainly than of any other artery of equal dimensions, there being sufficient space for the formation of an internal coagulum, admitting even that the formation of such is necessary to secure the adhesive process in an artery.

The Subclavian Artery may be tied on either side

* See Hodgson on Diseases of Arteries and Veins, *page* 110 and 345.

of the Neck during life, after it has passed the Scaleni Muscles, with great facility, provided the Clavicle have suffered no displacement. A ligature can also be passed around the right Subclavian Artery before it arrives at the Scaleni Muscles; this operation I shall denominate the Internal Operation of tying the right Subclavian Artery, in contradistinction to tying the artery after it has passed the Scaleni, which may be named the External Operation, and which may be performed with equal ease on either side of the Neck. I shall first detail the steps of this external operation, the object of which is to enable the Surgeon to pass a ligature around the Subclavian Artery in the third stage of its course,—that is, as it lies on the first Rib. The patient should be placed upon a table, in a horizontal position, with the Arm and Shoulder depressed as much as the circumstances of the case will permit; the Surgeon is then to divide the integuments immediately above the Clavicle from the external edge of the Sterno-mastoid Muscle to the anterior margin of the Trapezius, (in some cases the edges of these muscles are almost united, it will then be necessary to cut a few of their fibres,) the edges of this incision being separated, the Platisma-myoides and Cervical Fascia are to be divided on a director to the same extent; the external Jugular Vein will then be seen, and so close to the Mastoid Muscle, that I should recom-

mend its being pressed towards the tracheal side of the wound; in some cases, however, the vein lies more outwardly, and may be drawn towards the Trapezius Muscle; a quantity of loose cellular membrane is next to be cautiously torn through with the blunt extremity of the director, the Omo-hyoid Muscle will be then observed at the lower part of the wound, ascending obliquely from the Clavicle to the Mastoid Muscle, and forming the acromial side of the small triangular space before described; this muscle sometimes lies very close to the Clavicle, and must be drawn upwards and outwards towards the Trapezius, or, if deemed necessary, it may be divided. The Surgeon should next tear with his nail or with the end of the director, the thin fascia which lies behind the Omo-hyoid, and which is connected to the Scalenus Muscle; the acromial edge of this latter muscle may then be seen or felt, and by passing the finger along this to the Rib, the Subclavian Artery will be distinguished either by its pulsation, or by its peculiar feel. The aneurism needle may then be passed around it, and by directing the point of this instrument from below and from before, upwards and backwards, the vein will be secured from injury, and the nerves are so distinct, that they may be easily avoided. The prominence of the Clavicle will sometimes prevent the needle being passed from before backward, the Surgeon must then introduce it from above and from behind, and in pas-

sing it round the artery, should take care not to injure the Subclavian Vein, or some of those veins that are in its vicinity.

These veins have been found, in some cases, productive of great inconvenience to the operator; they are sometimes very large, and when wounded, bleed profusely; they lie very deep, and cannot be secured without much difficulty. MR. LIZARS, *in the System of Anatomical Plates*, part II, p. 70, suggests, that a tourniquet applied on the Arm may have the effect of diminishing the size of the Subclavian Vein; but the most troublesome veins in this operation arise from the Shoulder and side of the Neck, and cannot be affected by compressing the vessels of the Arm.*

* Although the Student should practise tying the principal arteries on the dead subject, yet from the facility with which this may be done, he is apt to receive erroneous impressions as to the simplicity and ease of such operations on the living. In the dead subject, when the arteries are injected, they appear prominent and distinct, while the large veins are flaccid and the small ones empty. I should recommend the Surgeon, previous to attempting any operation on the large arteries during life, to perform it, if possible, on the dead subject, having first injected the veins minutely, but not the arteries; he will then have the vessels in a condition somewhat similar to their living state, when the veins are found distended, while the arteries appear small and almost empty, or pulsate very feebly.

If the relation of the different parts to the Artery be not changed by the disease, there is no difficulty in performing this operation, and a ligature may be passed round the artery, and tied with great facility; but should the Clavicle have been much raised by the aneurismal tumour, the case will be different, the vessel will then appear at the bottom of a deep and narrow cavity, and the surrounding parts may have become so altered in structure and appearance, that considerable difficulty will exist in distinguishing between these, as well as in passing the needle around the artery and tying the ligature at such a depth from the surface.

I cannot depict these changes more strongly, nor describe the difficulties of the operation, in such a case, more accurately, than by quoting the following extract from the account of a late case of this kind, in which the operation was performed on the right side, by Mr. Todd, one of the professors of Anatomy and Surgery to the College of Surgeons, to whose judgment and decision, evinced in the different steps of this embarrassing operation, this interesting case owes its ultimate recovery:—

"The aneurism not only distended the Axilla, "so as to cause the Scapula to project consider- "ably backwards, but it was particularly prominent "anteriorly, its base extending upwards to the Cla- "vicle, which was much elevated, inwards to the

" edge of the Sternum, downwards to the nipple of " the Breast, and on the side of the Thorax to the " upper edge of the sixth Rib. The tumour was " tense, elastic, and pulsating; the entire limb was " œdematous, and the Elbow was separated to a " great distance from the side. The joints of the " Wrist and Fingers were remarkably loose; the " muscles of the fore Arm and Hand were com- " pletely powerless. No pulsation could be felt " in the Radial or Ulnar Arteries of the diseased " limb, and it had not sustained any remarkable " alteration of temperature."

In describing the operation, after dividing the integuments, Mr. Todd says, " Dividing the Pla- " tisma-myoides, fascia, and subjacent cellular tissue, " occupied a considerable time, in consequence of " the number of veins which it was found necessary " to secure with ligatures. The external Jugular " and two or three other superficial veins were " easily secured, but a series of more deeply seated " veins proved extremely troublesome; one branch " of these in particular, poured out blood in an alarm- " ing quantity, and receded so much within the " layers of fascia, that I was at last compelled to " use the needle, and to include in the ligature the " portion of fascia with which the divided vein " was connected. The venous hæmorrhage having " been at last effectually compressed, I proceeded

" to search for the Omo-hyoid Muscle; so much,
" however, was the relation of parts altered by the
" magnitude of the tumour, and consequent eleva-
" tion of the Clavicle, that this muscle was situated
" an inch below this bone, and it was found neces-
" sary to draw it up from its concealment, and to
" cut it across, that the subjacent parts might become
" accessible. Having applied my finger to the edge
" of the Scalenus Anticus, I was directed by it
" to the situation of the artery; but at this juncture
" causes of further difficulty arose, chiefly from the
" great depth of the wound, and the doubt which
" the almost total absence of pulsation in the artery
" naturally excited in regard to its identity. For
" some time I could not be convinced, that the
" feebly pulsating vessel, to which the point of my
" finger was applied, was really an artery of such
" magnitude as the Subclavian. The depth of the
" wound rendered it impossible to see to the bottom
" of it; I at length, however, succeeded in compres-
" sing the vessel between my fingers, when the
" pulsation of the tumour immediately ceased, re-
" turning when the pressure was discontinued. From
" the unusual degree of displacement of the Clavicle,
" it was expected that great difficulty would have
" arisen in the application of the ligature to the
" artery, I was, therefore, provided with the several
" instruments which have been recommended to

" facilitate this step of the operation; however, none " of these were employed, as the object was speedily " effected with the common aneurism needle. At " first I attempted to pass the needle in front of the " artery, with a view of giving every security to the " vein; to this, the position of the Clavicle con- " stituted an insuperable objection; I therefore di- " rected the needle along the margin of the Scalenus, " and then insinuated the point of it under the " artery from behind, guarding the vein with the " fore-finger of my left hand, until the point of the " needle was sufficiently elevated; I was then " enabled to seize the ligature with my fingers, the " needle was then withdrawn and the knot tied, a " sufficient tightness was insured by the ends of " the ligature having been passed in the ordinary " way through the Serre-nœud."—See *Dublin Hospital Reports*, vol. III. p. 466.

In the 78th Number of the Edinburgh Medical and Surgical Journal, is an account of a case of Subclavian Aneurism on the left side, in which the operation was successfully performed by Mr. Wishart, who mentions, that the success of the operation, and the short time in which it was performed, may be ascribed to the method employed, viz. after making the external incision, and dividing the Platisma-myoides Muscle, the laying aside the knife and using the fingers in separating the cel-

lular substance, so as to expose the artery. No difficulty was met with in passing the ligature, or in drawing it sufficiently tight with the fingers.

From these, as well as from other satisfactory cases of operation for the cure of Subclavian Aneurism, there can be no doubt as to what is the proper course to pursue in the treatment of this disease; I cannot, therefore, coincide with Mr. Shaw, who conceives, that the question of what ought to be done in common cases of Axillary or Subclavian Aneurism is still open, and merely hints to the Student, to inquire into the propriety of the proposal to remove the Arm.—See *Manual of Anatomy*, vol. I. p. 337.

The right Subclavian Artery may be tied on the tracheal side of the Anterior Scalenus Muscle; this operation, which I have named the Internal one, may be required in cases of aneurism of the Axillary or Subclavian Artery, extending so close to the Scalenus Muscle, that there is not sufficient space to pass a ligature around the artery, between the disease and the acromial edge of that muscle; this operation may also be required in cases of wounds, or of secondary hæmorrhage occurring after the external operation. The internal operation may be performed in the following manner: the patient being placed upon a table, in a horizontal position, with the Neck extended, divide the integuments

to the extent of about three inches immediately above the Clavicle, and parallel to the clavicular attachment of the Sterno-mastoid Muscle, beneath which insinuate a director, and detach the fibres of this muscle from the bone, then tear through some cellular membrane and separate some small arteries and veins, some of which may require a ligature; the Sterno-hyoid and thyroid Muscles being thus exposed, are next to be divided on a director first cautiously passed behind them; the internal Jugular Vein is then seen resting on the Scalenus Anticus, and the Subclavian Artery may be observed between this vein and the Carotid Artery, with the Vagus Nerve descending anterior to it, and sending its recurrrent behind it; the vein should then be drawn or pressed outwards by a broad retractor, and the Vagus drawn inwards towards the Carotid with a blunt hook; the aneurism needle may then be passed round the Subclavian Artery, and by directing it from below upwards, the right Vena Innominata and Pleura will be less endangered than by giving it a contrary direction. The ligature should be tied as near the Vertebral Artery as possible, and thus a sufficient space will be left for an internal coagulum to form between the ligature and the origin of the Carotid. In tying the ligature, the operator should endeavour to avoid including the branches of the Sympathetic Nerve, which form a

plexus round the Subclavian and Vertebral Arteries.

This operation of tying the right Subclavian Artery on the tracheal side of the Scalenus Muscle, was first performed in Steevens's Hospital, in the year 1813, by Doctor Colles, one of the Professors of Anatomy and Surgery to the College of Surgeons. The result of this case was unfavourable, as have been the first attempts in most of the principal operations on the larger arteries. Indeed, the history of surgery presents a singular coincidence in this respect; Hunter, Abernethy, Cooper, and Colles, have been all at first unfortunate in their operations on the large arteries, and success has failed to attend their efforts until after repeated trials, although fully as much dexterity and judgment appear to have been evinced in the former as in the latter. From the account of this case, however, we may deduce not only the practicability of the operation, but we may also infer, that no sudden dangerous effects are produced on the constitution by tying so large an artery in the vicinity of the Heart: this case also, in addition to many others, proves, that the free anastamoses between the Cervical and Brachial Arteries, can transmit a sufficient supply of blood to the superior extremity although the Subclavian be tied before it gives off any branch. After accurately describing all the particulars of this and of two cases of Axillary Aneurism,

Doctor Colles makes the following judicious observations, the value of which the surgical anatomist will fully appreciate, not merely in his study, but in the dissecting room, when he contrasts the right and left Subclavian Arteries in the first stages of their course:—

"To lay bare the right Subclavian Artery before "it reaches the Scaleni, will not be found difficult "by any Surgeon possessed of a steady hand and "a competent knowledge of anatomy; but I fear, "that with the utmost dexterity, much difficulty will "be experienced in passing and tying the ligature "around it, even in the most favourable case. This "operation, difficult on the right, must be deemed "impracticable on the left Subclavian Artery, for "the great depth from the surface at which this "vessel is placed, the direct course which it runs "in ascending to the top of the Pleura, the sudden "descent which it makes from this to sink under "the Clavicle, and the danger of including in the "the same ligature the eighth pair of nerves, the "internal Jugular Vein, or the Carotid Artery, which "all run close to, and nearly parallel with this "artery, these all constitute such a combination of "difficulties, as must deter the most enterprising "Surgeon from undertaking this operation on the "left side."—See *Edinburgh Medical and Surgical Journal*, No. 41, vol. 11.

In describing the operation of tying the Subclavian Artery, I have as yet taken no notice of the proposals of dividing the Clavicle and Subclavian Muscle, for the purpose of exposing the artery as it lies on the first Rib, or of dividing the Scalenus Anticus in order to tie it in the middle division of its course. As to the former, I cannot conceive any case which could justify so violent a proceeding as to saw through the Clavicle and divaricate the extremities of the bone to expose the artery; under the most unfavourable circumstances, I should prefer attempting either the external or internal operation, to having recourse to so objectionable a measure. As to dividing the Scalenus Anticus, in order to tie the artery in its middle stage, although I have had no experience of this mode of performing the operation, yet it appears to me open to strong objections on anatomical principles: in dividing this muscle, the internal Jugular Vein is in great danger of being wounded, the Phrenic Nerve also can scarcely escape; this nerve though generally near the tracheal edge, yet I have often observed it nearer the acromial margin of this muscle; what the consequences of dividing this nerve might be, I cannot venture to assert, but I think it more than probable that this accident would produce effects very alarming and unfavourable to the recovery of the patient after an operation from which more or less dyspnœa and dis-

turbance in the general circulation are to be apprehended; the artery is also in very close contact with the Pleura in this division of its course, and must undergo considerable displacement to admit of a ligature being passed around it; immediately internal to this point, the artery sends off its principal branches, the proximity of which may perhaps serve as an additional objection to this mode of performing the operation, were any further necessary, against a measure which has nothing peculiar to recommend it.

The Student may now proceed to dissect the branches of the Subclavian Arteries; these are in general similar on the right and left sides, but no other arteries in the body present a greater variety in the number and order of their branches; so uncertain are they in this respect, that seldom will any description be found exactly to correspond with nature. The principal branches, however, of each Subclavian Artery are five in number, three of which are given off in the first stage of its course, namely, the Arteria Vertebralis, Axis Thyroideus, and Arteria Mammaria Interna; the remaining two arise from the middle division of the Subclavian Artery, these are the Arteria Intercostalis Superior, and Cervicalis Profunda. The Subclavian Artery in its third stage gives off no regular branch; sometimes, however, the Supra-scapular Artery, and the Posterior Artery of the Scapula, (both of which are usually branches

of the Thyroid Axis,) arise in this situation; the Cervicalis Superficialis also, which is generally a small branch of the Transversalis Colli, sometimes arises from the third division of the Subclavian Artery.

I.

ARTERIA VERTEBRALIS,

Is always the largest but not uniformly the first branch of the Subclavian Artery; it arises from its upper and posterior part; (on the left side it sometimes arises from the arch of the Aorta between the left Carotid and left Subclavian Arteries;) it immediately ascends, inclining a little outwards and backwards, and between the Scaleni and Longus Colli Muscles enters the foramen in the transverse process of the sixth or fifth Cervical Vertebra, sometimes that of the seventh or fourth. The Vertebral Artery then ascends through the succession of foramina in the transverse processes of the Cervical Vertebræ, and having passed through that in the second Vertebra, it inclines outwards and upwards, making a remarkable curvature to reach the foramen in the transverse process of the Atlas; it then bends backwards almost horizontally behind the Occipito-atlantal Articulation, runs in a deep groove on the upper sur-

face of the Atlas, and perforates the posterior broad ligament beneath the Sub-occipital Nerve; the Vertebral Artery then runs forwards and upwards through the foramen magnum, to the lower edge of the Pons Varolii, where it joins the Vertebral Artery from the opposite side, and thus, by the confluence of these two vessels, the great Basilar Artery is formed. The Vertebral Artery should be first examined in the Neck, afterwards within the Cranium: its origin from the Subclavian Artery is covered by the superficial muscles of the Neck, and by the internal Jugular Vein, it is enveloped in the inferior cervical plexus of the Sympathetic Nerve; the Phrenic Nerve and anterior Scalenus Muscle are on its acromial side, the Vagus Nerve and Longus Colli Muscle lie to its inner or tracheal side. The Vertebral Artery, in its cervical course, gives off no particular branch, it sends a few arteries only to the deep muscles which are attached to the transverse processes; between the Atlas and Occipital Bone it sends off some large branches to supply the muscles at the upper and back part of the Neck, these anastomose with the Arteria Occipitalis and Cervicalis Profunda. As the Vertebral Artery ascends through the transverse processes, it lies anterior to the Cervical Nerves, along each of which it sends small branches into the Medulla Spinalis, which anastomose with the other arteries of that organ. The Vertebral Artery is

passing forwards from the Atlas to the Cuneiform Process, sends off several branches to the Dura Mater and nerves in this situation; it also, in this part of its course, generally gives off the Arteria Cerebelli Inferior, and the Arteriæ Medullæ Spinalis, Anterior et Posterior.

1. ARTERIA CEREBELLI INFERIOR VEL POSTERIOR. This artery, although in general described as arising from the Vertebral, yet often proceeds from the trunk of the Basilar; it runs in a very tortuous manner backwards and downwards, between the Vagus and Spinal-accessory Nerves, sends small branches to the origin of these nerves, and having arrived at the fissure at the back of the Cerebellum, where it is remarkably contorted, it divides into several branches, which ramify on the Pia Mater, investing the inferior and posterior part of this organ; some branches may be traced as far as the circumference of each hemisphere, where they anastomose with the superior arteries of the Cerebellum.

2, 3. ARTERIÆ MEDULLÆ SPINALIS POSTERIOR ET ANTERIOR. These are small and delicate arteries, remarkable for their length, their tortuosity, and their free and frequent inosculations with each other and with branches from different parts of the arterial system in the cervical, dorsal, and lumbar regions. The posterior Spinal Arteries are generally two in

number, each arises either from the Vertebral Artery, or from the branch last described; they first incline backwards to the posterior surface of the Spinal Marrow, and then descend nearly parallel to each other; if minutely injected, or if distended with blood, they may be traced as far as the Lumbar Region; their branches are very small, and anastomose with each other, and with the small arteries which enter the Intervertebral Foramina along with the different nerves.

The anterior Spinal Arteries are not so large as the posterior; each arises from the Vertebral Artery near the commencement of the Basilar, and descends along the anterior surface of the Medulla Spinalis, they soon unite with each other, and form one tortuous vessel, which descends to the inferior extremity of the Medulla Spinalis; throughout this course it is constantly sending branches to either side, which unite with the Posterior Spinal Arteries, and with those which have entered the Intervertebral Foramina.

ARTERIA BASILARIS.

NEAR the inferior extremity of the Pons Varolii, and between the origins of the Lingual Nerves, the two Vertebral Arteries converge, and from their

union the Basilar proceeds. This artery is seen most satisfactorily by removing the Brain from the Cranium, as was recommended in the description of the Internal Carotid. The Basilar Artery derives its name from the Basilar or Cuneiform Process of the Occipital Bone, on which it runs, extending from the anterior edge of the Foramen Magnum to the posterior clinoid processes of the Sphenoid Bone; in this course the Basilar Artery is covered and connected by the Arachnoid Membrane in a groove on the surface of the Pons Varolii, at the superior extremity of which it divides into four branches, two for the Cerebrum, and two for the Cerebellum: as the Basilar Artery ascends in this groove, it gives numerous small branches to the Pia Mater on either side, several of which enter the substance of the Pons. The Basilar Artery, at its commencement, separates the sixth or Abducentes Nerves of opposite sides, and between its terminating branches at the upper edge of the Pons Varolii, arise the third pair, or Motores Oculorum.

The terminating branches of the Basilar Artery are four, two to either side, namely, the Arteria Cerebelli Anterior, and Arteria Cerebri Posterior.

1. ARTERIA CEREBELLI ANTERIOR VEL SUPERIOR. This artery passes outwards and backwards around the upper part of the Tuber Annulare, and

arrives at the superior surface of the Cerebellum; it first sends several branches to the Pia Mater connected to the Tubercula Quadragemina, to the Pituitary Gland and to the Velum Interpositum; it also sends a small but very tortuous artery which enters the meatus auditorius internus, separating the Portio Dura and Portio Mollis of the seventh pair of nerves; this auditory branch sometimes arises from the Basilar, it is constantly present, but is very uncertain as to its origin. The superior artery of the Cerebellum then divides into long, delicate, and tortuous branches, which, after minute subdivisions, are distributed to the Pia Mater covering the convolutions of the Cerebellum. This artery, in the first part of its course, is parallel to the Trochlearis, or fourth nerve.

2. ARTERIA CEREBRI POSTERIOR is the termination of the Basilar Artery, and is larger than the last described branch; it passes outwards and backwards round the Crus Cerebri, and arrives at the inferior surface of the posterior lobe of the Cerebrum, it there divides into several branches, which are distributed to the Pia Mater in the same manner as are the other arteries of the Brain; this artery, at its commencement, is separated from that last described, by the origin of the third or Motor Oculi Nerve. Each Posterior Cerebral Artery receives the posterior communicating branch from the in-

ternal Carotid, and thus these vessels complete the anastomosis of Willis, which, although commonly described as a circle, yet is rather a quadrangle; it is formed in front by the anterior arteries of the Cerebrum, and their communicating branch, laterally by each internal Carotid and its posterior communicating branch, and behind by the trunk of the Basilar, and the Posterior Cerebral Arteries; within this anastomosis are situated the Infundibulum and Corpora Albicantia.

Thus is the Brain supplied with blood; four arteries, remarkable for their free communication with each other, not by small branches, but by large vessels, lie at the base of this organ, between it and the bones of the Cranium; the force of the circulation in these vessels is therefore imparted to this tender Viscus, producing upon it a lively impression, or, as Bichat expresses it, an excitement necessary for the performance of its functions. The ingenious and original remarks of this physiologist, contained in the second part of "*Recherches Physiologiques sur la Vie et la Mort*," are well worthy the attention of him who wishes to combine the study of anatomy and physiology in their natural and legitimate connexion.

The internal Carotid and Vertebral Arteries resemble each other in many respects; they both lie deep in the Neck, the Carotid being covered by

several muscles, and the Vertebral enclosed in a canal formed in part by bone, and in part by muscles: both the Carotid and Vertebral Arteries are very tortuous, and both form remarkable curvatures as they are entering the Cranium; these have been long considered as a natural design to retard the course of the circulation, or to diminish the force of the Heart in these vessels before they reach the Brain; this opinion could admit of no doubt were the arteries filled and emptied alternately with the Systole and Diastole of the Heart; but this is not the case: the arteries, as Bichat observes, are always full of blood, the motion communicated to this fluid cannot, therefore, be affected by any curvature, and must be felt as sensibly at the remote extremities of the vessels, as at their origin.—See *Anatomie Descriptive*, vol. IV. p. 202.

Mr. Charles Bell has very ingeniously endeavoured to prove, from a number of observations on the curvature of arteries, and on the changes which they undergo, that the natural design of curvatures on any vessel, is to increase its power and capacity; that the more tortuous any artery is, the more active it becomes, and that an artery, in proportion to its tortuosity, becomes less dependant on the force of the blood transmitted from the Heart, and more on the excitement of the organ which it serves.—See *an Essay on the Forces which circulate the Blood. By* MR. CHARLES BELL. *London*, 1819.

From the number and size of the inosculating branches of the arteries which supply the Brain, no interruption can possibly occur in the cerebral circulation from any obstruction in one or more of the primary vessels in the Neck. All the Cerebral Arteries terminate on the Brain in a similar manner; they divide as minutely as if entering a secreting or a glandular organ; these subdivisions take place not on the Arachnoid or serous membrane, but on the Pia Mater, on which they form numerous circles of anastomosis: these small vessels then enter the substance of the Brain, some cannot be traced farther than the cineritious substance; other very fine and long branches pass into the medullary or fibrous part of the Brain, and can be drawn out like long threads, not having much connexion to the parts around them.

II.

ARTERIA MAMMARIA INTERNA.

THIS is a large and a very regular branch, it arises from the lower part of the Subclavian Artery opposite the Vertebral; its course is first forwards, and then downwards into the Thorax, and through this cavity close to the internal surface of the cartilages of the Ribs near their sternal extremity, between the Triangularis Sterni and Intercostal

Muscles, and terminates in the Abdominal Muscles. This artery may be exposed either by everting the Sternum, together with the cartilages of the Ribs, or, in a young subject a neater dissection of this artery may be made, by carefully raising the Sternum and Cartilages of the Ribs from the artery, so as to leave it connected to the Pleura. As the Mammary Artery enters the Thorax, the Phrenic Nerve crosses anterior to it, and then descends on its inner side; like all arteries of the same size, it is accompanied by two veins. In this course, the Mammary Artery gives off several branches externally to the Intercostal Spaces, internally to the anterior Mediastinum, and at the Xyphoid Cartilage divides into two terminating branches; these branches are named from the parts they are destined to supply, these are the Intercostal Muscles, Mediastinum, Pericardium, Diaphragm, &c.

1. ARTERIÆ INTERCOSTALES ANTERIORES. At each of the five superior Intercostal Spaces, a branch passes outwards from the Mammary Artery, and runs at first between the Pleura and Intercostal Muscle, but it soon passes between the laminæ of these muscles; each of these arteries divides into two branches, which run along the opposite edges of the Ribs, and inosculate so freely with the posterior Intercostal Arteries from the Aorta, that it is difficult to mark any distinction between them. These Inter-

costal Arteries send several branches through the Intercostal Spaces to the muscles and integuments on the front of the Thorax; in the female some of these branches are very large, and enter the Mammary Gland; these superficial arteries anastomose with the Thoracic Arteries from the Axillary; occasionally some of these cutaneous branches are found very large, and may be traced to a considerable distance on the parietes of the Thorax. The Mammary Artery sends internally.

2. ARTERIÆ MEDIASTINI; under the head of arteries of the Mediastinum, we may class those fasciculi of branches which are sent to the adipose membrane, which occupies the situation the Thymus Gland formerly held, and also the branches to the Pericardium, Pleura, Diaphragm, and Triangularis Sterni Muscle. In the fœtus a very large branch, or even several, may be observed to pass into the Thymus Gland, these may be named the Thymic Arteries.

3. ARTERIA COMES NERVI PHRENICI arises from the internal Mammary near the upper part of the Mediastinum; it pursues a tortuous course along the side of the Pericardium to the Diaphragm, it assists in supplying this muscle, and anastomoses with the proper Phrenic Arteries. Posterior to the cartilage of the sixth Rib, the Mammary Artery terminates by dividing into two branches.

4. ARTERIA MUSCULO-PHRENICA passes obliquely downwards and outwards, along the margin of the Hypochondriac Region, close to the attachment of the Diaphragm, it sends a branch externally to each of the inferior Intercostal Spaces, and gives several branches to the Diaphragm.

5. RAMUS ABDOMINALIS is the last branch of the Mammary Artery; it sends small twigs towards the Xyphoid Cartilage, which anastomose with those of the opposite side; this branch then descends between the Peritoneum and Abdominal Muscles, and sends several long and tortuous arteries to the Recti and Transversi Muscles; the former of these inosculate with the Epigastric, and the latter with the Intercostal and Lumbar arteries, and with the Circumflexa Ilii.

The Mammary Arteries are remarkable for the number of their inosculations, and for the distant parts of the Arterial System which they serve to connect; they anastomose with each other, and their inosculations with the Thoracic Aorta encircle the Thorax; on the parietes of this cavity, their branches connect the Axillary and Subclavian Arteries; on the Diaphragm they form a link in the chain of inosculations between the Subclavian Artery and Abdominal Aorta, and in the parietes of the Abdomen they form an anastomosis most remarkable

for the distance between those vessels which it serves to connect, namely, the arteries of the superior and inferior extremities.

III.

AXIS THYROIDEUS,

ARISES from the upper part of the Subclavian Artery at the inner edge of the Scalenus Anticus, it inclines forwards and upwards, but almost immediately divides into four branches, two of which ascend, and two run transversely towards the Trapezius Muscle; the ascending branches may be named the Arteria Thyroidea inferior, and the Cervicalis Ascendens; the two transverse branches are the Arteria Transversalis Colli, and Transversalis Humeri, or Supra-scapularis.

1. ARTERIA THYROIDEA INFERIOR VEL ASCENDENS is the largest branch of the Thyroid Axis, is very tortuous, runs upwards and inwards over the Longus Colli Muscle, behind the Carotid Artery, Jugular Vein, Vagus, and Sympathetic Nerves; on the left side it is posterior to the Thoracic Duct; after several contortions it arrives at the side of the Trachea, sends several branches to that tube, also to the Œsophagus; it then bends in different direc-

tions accompanying the Recurrent Nerve, and reaches the Thyroid Gland, enters the posterior surface of its lateral lobes, and divides into numerous branches to supply this organ; these keep up a free anastomosis with the superior Thyroid Artery from the external Carotid, and with the inferior Thyroid Artery of the opposite side.

2. ARTERIA CERVICALIS ASCENDENS; this branch sometimes arises from that last described, and not from the Axis; it is in general a small artery, it ascends on the Scalenus and Rectus Capitis Lateralis Muscles, parallel to the Phrenic Nerve; its branches are distributed to the deep-seated muscles on the front and sides of the Vertebræ, small twigs accompany the Cervical Nerves through the Intervertebral Foramina, and anastomose with the Vertebral and Spinal Arteries; some branches also unite with arteries descending from the Occipital Artery.

3. ARTERIA SUPRASCAPULARIS VEL TRANSVERSALIS HUMERI is nearly as large as the inferior Thyroid; it passes across the Neck, descending a little, so as to lie somewhat behind the Clavicle, and is connected to the Subclavian Muscle by a thin fascia; it crosses the Scalenus Muscle, Subclavian Artery, and Phrenic Nerve, and runs along the base of the triangular space before described; when the artery has arrived at the notch in the superior Costa

of the Scapula, it enters the Supra-spinal Fossa more generally above, but sometimes below the ligament that converts that notch into a foramen. In this fossa the Scapular Artery divides into two branches, which may be named from their course and termination, the Supra and Infra-spinal Arteries. As the Supra-scapular Artery is passing across the Neck, it sends several recurrent branches to the cellular membrane behind the Sterno-mastoid Muscle, some of these pass between the two portions of this muscle, to the integuments on the Thorax, and some supply the Sterno-clavicular Articulation.

When the Supra-scapular Artery has arrived near the superior Costa of the Scapula, it sends off

1. *Arteria acromialis superior.* This branch runs downwards, forwards, and outwards, it generally perforates the clavicular portion of the Trapezius, but sometimes passes out anterior to this muscle; it then ramifies on the superior aspect of the Acromion Process, distributing its branches to the Trapezius and Deltoid Muscles, and inosculating with the Arteria Thoracica-acromialis, Subscapularis, and Profunda superior.

The Supra-scapular Artery also sends off several small branches, which ascend, and inosculate with the Transversalis Colli, and with branches from the Occipital Artery; in a well injected subject, the inosculations between the Supra-scapular, Transversalis

Colli, and Occipital Arteries, behind the Trapezius Muscle, appear numerous and free, and form a complicated net-work, which causes some embarrassment to the Dissector: from a careful dissection of these vessels, however, the Student may infer that their inosculations will be competent to afford an ample supply of blood to the superior extremity, in case the principal artery of the limb has been obliterated. When the Supra-scapular Artery has arrived at the notch or foramen in the superior Costa of the Scapula, it gives off several small branches to the muscles in the vicinity, namely, to the Trapezius, Serratus Magnus, Levator Anguli Scapulæ, &c.; and having entered the Supra-spinal space, it divides into its terminating branches.

2. *Arteria supra-spinalis*, supplies the Supra-spinatus Muscle, it sends some branches through the substance of this muscle to the posterior angle of the Scapula; some of these lie close to the bone, while others accompany the fibres of the muscle towards the Shoulder articulation, supply the Capsular Ligament, and inosculate with the Circumflex or Articular Arteries.

3. *Arteria infra-spinalis*. This artery, in size, appears the continuation of the Supra-scapular; it descends beneath the Acromion, and behind the Glenoid Cavity, to the Infra-spinal Space, where it divides into several branches; some of these sup-

ply the Infra-spinatus and Teres Minor Muscles, others pass towards the base of the Scapula, and inosculate with the posterior Scapular Artery, and others descend close to the bone, to the inferior Costa, and inosculate with the Sub-scapular.

4. ARTERIA TRANSVERSALIS COLLI. This is the last, and generally the largest branch of the Thyroid Axis; like the last described artery, it passes outwards, and crossing the Scalenus Anticus, and Brachial Plexus of nerves, between the Mastoid and Trapezius Muscles, it divides into two principal branches, viz. the Arteria Cervicalis Superficialis, and Arteria Scapularis Posterior; before thus dividing, it gives off several small branches to the deep-seated muscles, nerves, and glands, in this region.

1. *Arteria cervicalis superficialis.* This artery, as its name implies, is distributed to the integuments and fascia of the Neck, also to the lymphatic glands, and to the cervical plexus of nerves situated between the Mastoid and Trapezius Muscles; to these muscles it gives several branches; and beneath the Trapezius, it divides into long and delicate branches, some of which ascend to meet the descending branches from the Occipital Artery, and to assist in supplying the muscles on the back of the Neck, while others descend towards the acromion and spine of the Scapula, and inosculate with the Supra-scapular.

2. *Arteria scapularis posterior* in general appears the continued trunk of the Transversalis Colli, but frequently it arises distinctly from the trunk of the Subclavian Artery external to the Scaleni Muscles; it is always present, but its origin is very irregular. To expose this Artery, the Trapezius and Rhomboid Muscles must be partially divided, and some adipose and cellular membrane carefully removed; it may be then observed turning round the side of the Neck behind the Levator Anguli Scapulæ Muscle, and towards the posterior angle of the Scapula; it then bends downwards, and runs in a vertical direction along the base of the Scapula, as far as the inferior angle of that bone; in this part of its course, the posterior Scapular Artery is covered by the Rhomboid Muscles, beneath which it divides into two or three branches, one of which descends close to the base of the Scapula, the others pursue a parallel course nearer the Vertebræ; long branches are given off from these to the Rhomboid, Latissimus Dorsi, and Trapezius Muscles, and some pass deep to the extensor muscles of the Spine, inosculating with the posterior branches of the Intercostal Arteries. The continuation of the posterior Scapular Artery may be traced to the inferior angle of the Scapula, where it divides into several branches, some of which are distributed to the Latissimus Dorsi, Teres Major, and Serratus Magnus Muscles,

and others pass inwards towards the Axilla, and anastomose very freely with the Sub-scapular Artery.

The three margins of the Scapula are thus bordered by arteries, the Supra-scapular being parallel to the superior Costa, the posterior Scapular to the base, and the Sub-scapular to the inferior Costa of this bone; these three arteries form a chain of inosculations around the Scapula, which must be of essential service in conveying blood from the Subclavian Artery to the Axillary, when the former has been obliterated in the third stage of its course.

When the Subclavian Artery has entered its middle stage, it gives off its two last branches, namely, the deep Cervical, and superior Intercostal.

IV.

ARTERIA CERVICALIS PROFUNDA.

This artery lies deeply concealed both at its origin and throughout its whole course; it frequently arises in common with the superior Intercostal; it first runs upwards, outwards, and backwards, sunk between the Transverse Processes of the sixth and seventh Cervical Vertebræ, and between the branches of the Brachial Plexus of nerves; it then ascends on the posterior surface of the Cervical Vertebræ between

the Spinous and Transverse Processes, lying close to the bones, and giving off numerous branches to the deep-seated muscles on either side; and near the Occipital Bone it inosculates with the Vertebral Artery, and with the deep descending branches from the Occipital Artery.

V.

ARTERIA INTERCOSTALIS SUPERIOR,

ARISES close to the last described branch from the lower part of the Subclavian Artery; it immediately descends in front of the neck of the first Rib, external to the first thoracic ganglion of the Sympathetic Nerve; at the first Intercostal Space it sends a branch, which runs, like the other Intercostal Arteries, between the Muscles, supplies these, and sends some branches to the integuments, and to the Pleura; the superior Intercostal Artery then descends in front of the neck of the second Rib, and supplies the second Intercostal Space in a manner similar to the first; but sometimes, particularly on the right side, a branch is continued in front of the third Rib to the third Intercostal Space. A small branch always connects the superior Intercostal Artery to the first Intercostal from the Thoracic Aorta.

The Subclavian Artery, in the third division of its course, gives off no regular branch, though very frequently some of those arteries which I have described as arising from the Thyroid Axis, will be found to take their origin from it. The Transversalis Colli, which is the third branch of the Thyroid Axis, and which, when regular, divides into the superficial Cervical and posterior Scapular, is sometimes a small branch, and ends in the superficial Cervical; in such a case, the posterior Scapular Artery will be found to arise distinctly from the Subclavian on the external side of the Scaleni Muscles, it will then pass between some of the nerves of the Brachial Plexus, and pursuing its tortuous course towards the superior angle of the Scapula, it may be traced along the base of that bone.

In some subjects, the Supra-scapular also will arise from the external part of the Subclavian Artery, and not from the Thyroid Axis; and sometimes the supra and posterior Scapular will arise by a common trunk. From the Subclavian a small branch often proceeds, and takes the course of the superficial Cervical when the Transversalis Colli has been absent; occasionally small branches arise from this division of the Subclavian Artery, which deserve no particular description or name; they are distributed to the Brachial Plexus, to the Scaleni, and deep-seated muscles on the side of the Neck, some also pass to the Axilla and Serratus Magnus Muscle.

The most regular branches of the Subclavian Artery, in its first stage, are, the Vertebral, internal Mammary, and inferior Thyroid; and in the second stage, the deep Cervical and superior Intercostal. The arteries most subject to variety, not as to their situation, but as to their origin, are, the Supra-scapular and posterior Scapular Arteries, the former being, when regular, a branch of the Thyroid Axis, and the latter, a branch of the Transversalis Colli, which is also derived from the Thyroid Axis.

The branches of the Subclavian Arteries will be sometimes found to vary in number and size on the right and left sides of the Neck.

ARTERIA AXILLARIS.

THE continuation of the Subclavian Artery receives this name at the inferior border of the first Rib, and retains it until it arrives at the lower margin of the tendon of the Latissimus Dorsi, and Teres Major Muscles. The dissection of the Axillary Artery is difficult, not only in consequence of the number of branches it gives off, but also from its being surrounded by the Brachial Plexus of nerves, and by a considerable quantity of cellular membrane containing lymphatic glands, and several arteries and veins; this dissection, however, should be made with great care, as the parts concerned are of practical importance. The Student should endeavour to retain the muscles, nerves, and vessels, as much in their natural situation as possible, and those which must be displaced, he should preserve in such a manner, as that he may restore them at pleasure, so as to study the relative anatomy of the different parts contained in the Axilla.

The integuments and cellular membrane are first to be removed from the Pectoral and anterior portion of the Deltoid Muscles, and from the inferior part of the Axilla, as far as the Latissimus Dorsi and Teres Major Muscles; the floor or base of this cavity will then be observed to be closed by a strong fascia.

passing from its anterior to its posterior border; this fascia descends on the Ribs, and is attached externally to the muscles of the Arm; (a strong band of muscular fibres sometimes connects the margins of the Pectoral and Latissimus Dorsi;) in this fascia are distributed several small nerves, veins, and arteries; if this aponeurosis be divided in a direction from the Arm to the Ribs, the cavity of the Axilla will be opened, and by tearing through some loose cellular membrane towards the Humerus, the trunk of the Axillary Artery and Vein will be brought into view, the latter covering the artery. Along the posterior border of the Axilla, also, a large vessel may be seen, this is the Sub-scapular Artery, attached to which are several lymphatic glands; and along the anterior margin of the Axilla there is another artery of considerable size, namely, the long Thoracic or external Mammary, with which also some conglobate glands are connected; if the loose cellular membrane in the middle of the Axilla be now removed, a plexus of small arteries and veins will be exposed, the branches of which run in every direction to and from the conglobate glands of this region.

To this view of the Axilla from below, the Student should pay particular attention, for it is in this direction this cavity is to be opened in the operation of extirpating diseased glands in the living subject;

from this he may learn, that there is no danger in dissecting in towards the Ribs, when the Arm is held apart from the body, but that if it be necessary to pursue the dissection towards the external or humeral side of the cavity, or towards its apex, the Surgeon must proceed with great caution, as the Axillary Vein is in imminent danger; and in dissecting towards the posterior part of the Axilla, the course and size of the Sub-scapular Artery and Vein should be recollected.* The glands most frequently diseased, are those immediately behind the great Pectoral Muscle; in extirpating these, particularly if they lie near the Ribs, no vessels of large size are endangered, the Thoracic Arteries alone can be wounded. Though the Thoracic Vessels are small, yet they bleed smartly when cut, and there is some difficulty in drawing them out of the loose cellular membrane into which their divided extremities retract: hence, in removing a tumour which has extended deep into the Axilla, the Surgeon is frequently obliged to pass a ligature around its base, and before he cuts it, to tie the fasciculus of vessels which are entering its substance; this proceeding, no doubt, is often productive of pain and inconvenience, and retards the healing process; but in such a case, the operator has no alternative.

* See Surgical Anatomy, by A. Colles, p. 124.

The Student may now proceed with the dissection of the Axillary Artery from above, and should first divide the great Pectoral Muscle from its clavicular to its inferior edge, avoiding such large branches as may lie immediately posterior to it; the edges of this muscle being separated, and some loose cellular membrane removed, the lesser Pectoral will be exposed; this muscle does not rise so high as the Clavicle, therefore, between its superior edge and the Subclavian muscle, the Axillary Artery and Vein are partly exposed, a dense fascia, however, is extended over them; this fascia, in some subjects, is very strong, *like* a ligament, and is considered as such by some anatomists, who have given it the name of Costo-coracoid Ligament; it extends from the cartilage of the first Rib to the Coracoid Process, and adheres to the Clavicle and Subclavian Muscle between these two points; it is very strong, as it passes over the Axillary Artery, presenting a lunated edge, which looks downwards and inwards. The lesser Pectoral Muscle should be next divided from above downwards, and the edges being separated, the Axillary Artery and Vein will be exposed through their entire course; the direction in which these run depends on the relative position of the Arm to the trunk; as the subject lies on the table the Arm abducted so as to form a right angle with the side, the Axillary Artery runs outwards, backwards, and a little down-

wards; but if the Arm be approximated to the side, the artery will be somewhat curved, the convexity towards the Shoulder.

The Axillary Artery crosses the Axilla obliquely, superiorly lying on the thoracic, and inferiorly on the humeral side of this region. For the purpose of more accurately examining its relations to the surrounding parts, the Student may divide it into three portions, a superior, middle, and inferior. The superior portion of the Axillary Artery rests upon the first layer of intercostal muscles, and the second digitation of the Serratus Magnus Muscle, and it is covered by the clavicular part of the great Pectoral Muscle, and by the Costo-coracoid Ligament. A sharp-pointed instrument passed obliquely inwards, between the Deltoid and Pectoral Muscles, may wound this portion of the artery without dividing any muscle; the Cephalic Vein, and the Acromial-thoracic Artery, will, in all probability, be injured by a wound of this description.

The middle division of the Axillary Artery crosses the Axilla, lies on, and is partly enveloped by the Brachial Plexus of nerves, and is covered by both Pectoral Muscles.

The inferior third of the Axillary Artery rests against the Subscapular Muscle (which separates it from the capsular ligament of the Shoulder-joint) and the tendons of the Latissimus Dorsi and Teres Major

Muscles; this portion of the artery is only covered by the great Pectoral Muscle and the integuments.

The Axillary Artery is accompanied by the Axillary Vein and Brachial Plexus of nerves; in the superior third the vein is superficial to the artery and to its sternal side, the plexus of nerves is posterior, and to its acromial side; in the middle third the vein is more directly in front of the artery, and the nerves are around it, forming the Axillary Plexus, from which the different branches proceed to the Arm; in the inferior third the vein is still superficial to the artery, and here, in general, it receives several branches from different directions. The nerves are generally related to this division of the artery in the following order: the Brachial or Median Nerve, proceeds from the plexus by two roots, between which the artery is placed; on the radial side of the artery are the external root of the Median Nerve and the external Cutaneous or Perforans Casserii; on the internal side of the artery are the internal root of the Median, the internal Cutaneous and Ulnar Nerves; and posterior to the artery, are the Circumflex and Musculo-spiral Nerves; near the lower margin of the Latissimus, the internal Cutaneous and Median Nerves are sometimes superficial to the Artery.

Before the Student proceed to trace the branches of the Axillary Artery, he should consider in what

situation this vessel may be exposed in the living subject. The proposal of compressing this artery against the second Rib, I have considered, and endeavoured to refute, when describing the mode of compressing the Subclavian above the Clavicle; and if the Student will carefully contrast these two situations in the dead subject, I have no doubt he will decide in favour of the latter, as that in which compression of the artery can be most effectually applied.

The Axillary Artery may be exposed in two situations, namely, at the lower and at the upper part of the Axilla; in either situation a Surgeon may be required to tie this artery in cases of wounds or aneurism of the upper part of the Brachial Artery. These operations on the Axillary Artery may be distinguished by the terms inferior and superior; the former can be easily performed, and is nearly similar to that of tying the Brachial Artery; the latter, however, is extremely difficult and dangerous, and in very few cases only ought to be preferred to the comparatively easy operation of tying the Subclavian Artery external to the Scaleni Muscles.

We shall consider the best mode of performing both these operations, and first the inferior one, because it is attended with less difficulty and danger, and because it is more frequently necessary than the superior operation. The Axillary Artery may be

tied, in the inferior part of its course, in the following manner: the patient should be laid upon a bed or table, the Arm separated from the side, and the hand supinated; make an incision about two inches in length, through the integuments and cellular membrane, over the prominence of the head of the Humerus, and between the tendons of the Pectoralis Major and Latissimus Dorsi, but a little nearer to the latter: the Median Nerve and Axillary Vein will be then exposed; the former may be drawn to the radial, the latter to the ulnar side of the artery; bending the fore Arm will relax the nerves, and by detaching the surrounding cellular membrane with the finger or a blunt instrument, an aneurism needle may be passed round the artery from the ulnar to the radial side. In this part of the operation every precaution must be taken to avoid injuring the veins or nerves, their relation to the arteries not being uniform; sometimes a nerve will cross the artery, and in place of one large vein, there may be two or three accompanying the artery, one on each side, and one in front.

The superior operation may be performed in the following manner: the patient may be seated, with the shoulder of the affected side inclined backwards, an assistant should be placed behind the patient, with instructions to compress the Subclavian Artery in the event of hæmorrhage; a semilunar incision is to

be made about three inches long through the integuments, commencing about one inch from the sternal end of the Clavicle, and extending towards the Acromion Process as far as the anterior edge of the Deltoid Muscle, avoiding the Cephalic Vein and Thoracica-acromialis Artery; the Clavicular Portion of the Pectoral Muscle is thus exposed, and is to be divided in the same direction, and to the same extent, as the external wound; the flap thus formed is then to be everted, and some loose cellular membrane being detached, the superior edge of the lesser Pectoral Muscle will be exposed: in this stage of the operation, several branches of the Thoracic Arteries are in danger of being wounded. A director should then be insinuated beneath the strong fascia extending from the Subclavian Muscle to the Coracoid Process, and a portion of the fascia divided; some loose cellular membrane and a few small blood-vessels being detached with the blunt extremity of a director, the Axillary Vein will be exposed: this vessel should be pressed inwards towards the Ribs, and the artery will be felt or seen pulsating; it must be carefully detached from the nerves for a short distance, and the aneurism needle passed under it, the needle being directed from the thoracic to the acromial side. In applying the ligature, it is to be recollected that one of the large nerves of the Plexus inclines to the front of the

artery, and having a pulsation communicated to it, might be mistaken for the artery itself.

Even on the dead body, this operation is by no means easily performed, but on the living subject it must be attended with considerable difficulty, particularly in corpulent persons, the depth at which, in such individuals, the artery lies, together with its complicated relations, must render the application of a ligature to it peculiarly hazardous. It appears to me that few cases can occur in which the operation now described ought to be preferred to that of tying the Subclavian Artery external to the Scaleni Muscles; at the same time it must be admitted that an extensive wound passing through the Pectoral Muscle, may expose the Axillary Artery, so as to render the application of a ligature to it in this situation comparatively easy.

Mr. Shaw, *in Manual of Anatomy*, vol. i. p. 344, having concluded the account of Mr. Todd's case of Subclavian Operation, says, "The anatomy of the artery below the Clavicle should be more interesting to the Student, for the tying of it is a more practicable operation, and has occasionally been attended with success." Surely Mr. Shaw does not mean to infer, that in a healthy subject it is an easier operation to expose the Axillary Artery, by cutting through the Pectoral Muscle, than to tie the Subclavian Artery above the Clavicle, where it

is covered only by the general integuments of the Neck; or should an operation be required in a case of axillary aneurism, that it is even practicable, in the majority of instances, to pass a ligature round the artery between the seat of the disease and the Clavicle. The number of cases in which this operation has been performed are very few, and although it has in one or two instances been successful, yet, from an impartial review of the cases, and still more from an attentive examination of the relative anatomy of the artery above and below the Clavicle, and from having frequently practised the operation on the dead subject, in both these situations, I cannot avoid coming to a conclusion very different from that which Mr. Shaw has deduced from a comparison of the artery above and below the Clavicle. The conclusion which I feel disposed to draw from such a comparison is, that in every case of axillary aneurism, in which an operation is not contra-indicated by general or local objections, that the operation of tying the Subclavian above the Clavicle, external to the Scaleni Muscles, ought to be preferred, as being more easily performed, and being attended with less danger and injury to the surrounding parts.—See HODGSON *on Diseases of Arteries and Veins*, p. 359; *and* LIZAR'S *Anatomical Plates*, part III. p. 74.

The Student may now proceed to trace the bran-

ches of the Axillary Artery; these are distributed to the muscles and glands in the Axilla, to the parietes of the Thorax and muscles of the Shoulder; their number is uncertain, and the order in which they arise irregular. Seven principal branches may in general be observed; four of these are called Thoracic Arteries from their destination, and are distinguished by the names of, 1st, Thoracica Acromialis, 2nd, Thoracica Suprema, 3rd, Thoracica Alaris, 4th, Thoracica Longa: three branches pass outwardly, and supply the great mass of muscles around the Scapula and Shoulder-joint, these branches are named Arteria Subscapularis, Circumflexa Posterior and Anterior; these external branches, although not constant in their size or situation, yet are much more uniform than the thoracic branches, which are peculiarly uncertain in number and origin.

I.

ARTERIA THORACICA ACROMIALIS,

Is an artery of considerable size, arises immediately beneath the Clavicle and above the Pectoralis Minor, opposite the fissure between the Deltoid and Pectoral Muscles, through which the Cephalic Vein passes to join the Axillary Vein. This artery is like a short axis, it stands out from the front of the Axillary Artery, and soon divides into a lash of branches which pursue three directions; first, several pass inwards and backwards towards the Serratus and Pectoral Muscles, and anastomose with the Intercostal and Mammary Arteries; secondly, two or three pass forwards and downwards, accompany the Cephalic Vein, are distributed to the Deltoid Muscle and integuments of the Shoulder, and anastomose with branches from the Circumflex and superior Profunda Arteries; the third set of branches run towards the Acromion Process, one large branch (inferior Acromial Artery) passes to the superior surface of this process, and joins the acromial inosculation between this artery, the Transversalis Colli and Supra-scapular Artery; the remaining branches run beneath the Deltoid, supplying this

muscle and the large bursa between it and the capsular ligament; these communicate freely with branches of the Circumflex Arteries.

II.

ARTERIA THORACICA SUPREMA.

FREQUENTLY arises from the last described artery, sometimes above it, but in general immediately below it, and at the superior margin of the lesser Pectoral Muscle; the great Pectoral must be divided to expose this artery, the branches of which are distributed to the two Pectoral Muscles, to the cellular membrane between them, also to the parietes of the Thorax, and inosculate with the Mammary and Intercostal Arteries.

III.

ARTERIA THORACICA ALARIS.

ARISES about the middle of the Axilla, and immediately divides into several branches; these supply the glands and cellular membrane in the cavity of the Axilla, some pass across to the Intercostal Muscles, others to the Pectoral and Sub-scapular

Muscles; these arteries, with their accompanying veins, together with several nerves which pass from those in the Intercostal Spaces to the inner side of the Arm, form an intricate plexus across the Axilla. This Alar Thoracic Artery frequently arises from some of the other thoracic branches; a fasciculus of small arteries, arising either from the Axillary or some of its branches, often supply the place of this Alar or Axillary Thoracic Artery.

IV.

ARTERIA THORACICA LONGA, VEL MAMMARIA EXTERNA.

Arises opposite the lower margin of the Pectoralis Minor, to which it runs parallel, and descends along the side of the Thorax, between the great Pectoral and Serratus Muscles, giving branches to these and to the integuments; it also sends branches across the Axilla to the Sub-scapular Muscle; this artery, like the other Thoracic, anastomoses with the internal Mammary and Intercostal Arteries.

In some subjects there are five or six thoracic branches arising from the Axillary Artery, while in others, on the contrary, there are only two arising separately, and from these the other branches proceed.

The Thoracica Acromialis, and Longa, are the most regular; from the former the Thoracica Suprema frequently arises, and from the latter the Thoracica Alaris.

V.

ARTERIA SUB-SCAPULARIS,

Is generally the largest and most regular branch of the Axillary Artery, it arises opposite the lower edge of the Sub-scapular Muscle, is at first covered by some of the nerves of the Brachial Plexus, runs backwards and downwards parallel to the inferior costa of the Scapula, is accompanied by a large vein, and at about one inch and a half distance from its origin it divides into an anterior and posterior branch.

1. RAMUS ANTERIOR, in direction, but not in size, appears as the continued trunk; it runs along the lower edge of the Sub-scapular Muscle, and internal to the Serratus Magnus and Latissmus Dorsi; near the inferior angle of the Scapula it divides into numerous branches, some of which are distributed to the surrounding muscles, and descend along the side of the Thorax, others pass into the substance of the Sub-scapular Muscle, and several continue as far as the inferior angle of the Scapula, where they inosculate freely with the posterior Scapular

Artery, which is in general a branch of the Transversalis Colli.

2. RAMUS POSTERIOR, or Arteria Circumflexa Scapulæ, bends round the inferior costa of the Scapula, and passes out of the Axilla through a large opening which is bounded in front by the long portion of the Triceps, below by the Teres Major, and above by the Scapula and muscles which adhere to its inferior Costa; to these muscles this vessel sends several branches. The termination of this artery on the dorsum of the Scapula may be exposed by placing the Arm across the Chest, dividing the posterior third of the Deltoid Muscle, and cutting through some of the fibres of the Teres Minor and Infra-spinatus Muscles, the Arteria Circumflexa Scapulæ will then be seen dividing into an ascending and descending branch; the ascending, or the Arteria Infra-spinata, ascends in the Infra-spinal Fossa, close to the bone, a little behind the neck of the Scapula, and joins the Supra-scapular Artery, which descends beneath the Acromion Process. The Arteria Infra-spinata supplies the muscles on the dorsum, and sends branches to those connected with the base of the Scapula, these join the posterior Scapular Artery, while others run towards the Shoulder, enter the Deltoid muscle, and anastomose with the Circumflex Arteries; others ascend towards the Acromion,

and unite with branches from the Supra-scapular and Thoracica-acromialis Arteries. The other division of the Circumflex Scapulæ runs downwards and backwards on the Teres Major and Latissimus Dorsi Muscles, and at the inferior angle terminates in a free anastomosis with the posterior Scapular Artery, and with the anterior branch of the Sub-scapular.

If the Student will now observe the situation of the Subscapular Artery and its anterior branch, he will learn, that in operations in the Axilla, it can be endangered only by dissecting towards the posterior part of this cavity. To the numerous and free inosculations that exist around the Scapula, and in which the branches of the Sub-scapular Artery bear so conspicuous a part, the Arm must be principally indebted for a due supply of blood when the Subclavian Artery has been obliterated; to this anastomosis, however, I shall again refer, when taking a general review of the arteries of the superior extremities.

VI.

ARTERIA CIRCUMFLEXA POSTERIOR.

Arises from the posterior part of the Axillary Artery, very near the Sub-scapular, and sometimes from the latter; a small part only of this artery

can be seen in the Axilla, for it immediately bends backwards and outwards, and leaves the Axilla, by a large opening in front of the long head of the Triceps, and behind the Humerus, bounded below by the tendon of the Latissimus Dorsi, and above by the Capsular Ligament. The Circumflex Nerve accompanies this vessel, and both encircle the neck of the Humerus; its branches are exposed by making a transverse incision through the Deltoid Muscle, the trunk of the artery will be then observed passing on the outside to the forepart of the Humerus, giving numerous branches to the Deltoid Muscle, some of which ascend to the Acromion Process and Shoulder-joint, others descend in the direction of the Humerus, and inosculate with the superior Profunda, a branch of the Brachial Artery.

VII.

ARTERIA CIRCUMFLEXA ANTERIOR,

Is smaller than the last described artery, from which it sometimes arises; in other instances it is given off by the Subscapular, the Brachial, or the superior Profunda; it usually arises however from the front of the Axillary Artery, opposite, or a little inferior to the posterior Circumflex Artery; it passes outwards and forwards behind the external Cutaneous

Nerve, Coraco-brachialis, Biceps and Deltoid Muscles, it lies close to the Humerus; its branches are distributed to the muscles which cover it, also to the bone and to the Capsular Ligament; two or three branches ascend along the Bicipital Groove to the Articulation, and supply the Synovial Membrane. This artery anastomoses directly with the posterior circumflex, superiorly with the Thoracica-acromialis, and inferiorly with the superior Profunda.

From the manner in which these Circumflex or Articular Arteries encircle the neck of the Humerus, they and their accompanying veins are liable to be lacerated in fractures of that part of the bone; and in such cases there is frequently considerable ecchymosis and swelling in the direction of the Axilla. These circumflex arteries must be concerned also, not only in amputation at the Shoulder-joint, but also in removing the head of the bone, when fractured, or comminuted by a gun-shot, or when carious from disease or accident.

In the dissections which the Student may make of these arteries, he must not expect to find every thing to correspond exactly with the foregoing detail; it would, indeed, be impossible to give such a description as could embrace all the varieties that are met with in this part of the arterial system; nor is the want of such attended with any

disadvantage; a knowledge of the fact that such irregularities do frequently exist in the origin of these arteries, is sufficient to lead to this practical rule, that in all operations in their vicinity great caution is to be observed.

There is, however, one variety in the Axillary Artery occasionally met with, which is calculated to perplex a Surgeon not a little when engaged in an operation on this vessel;—that is, its division into the arteries of the fore Arm; this sometimes occurs so high as the lower margin of the Subclavian Muscle, but it is more frequently met with below this point.

When the Axillary Artery thus divides into two branches, the larger and deeper one receives the name of Axillary, and becomes the Brachial, supplying the Arm; the smaller branch is generally found to become the Radial Artery, or near the bend of the Elbow to join the proper Brachial Artery.

If a Surgeon, in proceeding to tie the Axillary Artery, were to find two vessels, the difference in the size and situation of which could not enable him to distinguish the Brachial from the irregular branch, he should endeavour to ascertain, by the cessation of pulsation in the tumour on pressure, which is the proper branch to secure. This expedient, however, will not answer in every case, for sometimes there are two or three cross branches uniting these arteries as they descend along the Arm: of this

variety there is a specimen in the Museum, which I found last season in the dissecting-room. A knowledge that such an arrangement of these arteries does occasionally exist, may serve as an additional inducement with the operator to lay bare the artery near the seat of the disease; such practice, though not advisable in aneurism in the inferior extremities, where the coats of the artery are in general found more or less diseased, yet as aneurism in the superior extremities is usually the effect of injury, there is no objection to passing a ligature around the vessel near the aneurismal tumour. If the extent of the disease did not admit of this being done, the operator must tie both arteries, and I believe he need not have any apprehension as to the capability of the anastomosing branches establishing a collateral circulation sufficient to support the limb.

ARTERIA BRACHIALIS.

FROM the inferior margin of the tendon of the Teres Major Muscle to the bend of the Elbow, the continuation of the Axillary Artery receives the name of Brachial; to expose this artery, the Student should first raise the integuments from the Arm and upper part of the fore Arm, preserving the cutaneous veins in their natural situation, particularly at the bend of the Elbow, where venesection is usually performed.

The cutaneous veins of the Arm arise from a plexus of these vessels on the back and front of the Hand and Fingers by three principal branches, viz. the Vena Cephalica, Basilica, and Mediana; the Vena Cephalica ascends along the radial side of the fore Arm to the bend of the Elbow, where it receives the branch of the Median Vein, called Median Cephalic; the Cephalic Vein then ascends along the outer side of the Arm, at first lying between the Biceps and Supinator Radii Longus; above this, between the Biceps and Triceps, and lastly, between the Pectoral and Deltoid Muscles, and joins the Axillary Vein a little below the Clavicle. The Cephalic Vein is accompanied from the

Elbow to the Hand by branches of the external Cutaneous Nerve.

The Basilic Vein ascends on the ulnar side of the fore Arm, and near the bend of the Elbow receives the Median Basilic Branch from the Median Vein, the Basilic Vein then ascends along the inner side of the Biceps, and joins one of the venæ comites of the Brachial Artery, sometimes near the Elbow, and sometimes near the Axilla.

The Median Vein ascends along the middle of the fore Arm, and near the Elbow divides into three branches, namely, Mediana Basilica, *Mediana* Cephalica, and Mediana Profunda; this last named branch passes through the fascia of the fore Arm, and joins the deep veins. The Basilic Vein is accompanied by branches of the internal Cutaneous Nerve, and the Median Vein is accompanied by branches of both the internal and external Cutaneous Nerves; all the cutaneous veins of the fore Arm are very irregular in number, size, and situation.

The muscles of the superior extremity are covered by an aponeurosis which is thin and weak on the Arm, but very dense and strong on the fore Arm, particularly near the bend of the Elbow; this aponeurosis is, in part, derived from the tendons of the Pectoral and Latissimus Dorsi Muscles, and in part from the spine of the Scapula, and posterior edge of the iscle; it is continued all round the

Arm, is weaker on the Biceps and Triceps than it is between those two muscles where it covers the brachial vessels and nerves; as it descends it receives additional fibres from the tendon of the Coraco-brachialis, and additional strength from adhering to the external and internal intermuscular ligaments; at the bend of the Elbow an aponeurotic expansion is derived from the anterior edge of the Biceps Tendon, and spreads in a direction towards the internal Condyle, and is united to the fascia of the fore Arm, and to the common origin of the Flexor and Pronator Muscles. The Student should next divide the fascia of the Arm between the Biceps and Triceps, and raise the cutaneous veins and fascia of the Biceps from the bend of the Elbow, and merely turn them to the radial side, so that he can afterwards replace them, and study their relative situation to the artery; a little dissection will now expose the whole course of the Brachial Artery; it has no very distinct sheath, and is only surrounded by some loose cellular membrane.

The Brachial Artery extends obliquely from the lower margin of the tendon of the Teres Major Muscle to the middle of the bend of the Elbow; superiorly it lies on the ulnar side of the Humerus, but inferiorly it is opposite the middle of its anterior surface. In this course the artery is covered only by the integuments and fascia of the Arm; the Coraco-brachialis and Bi-

ceps Muscles overlap it a little in the upper and middle third of the Arm; but in a thin person it can be traced by its pulsation through its whole course: at the bend of the Elbow it sinks a little deeper, and is covered by the aponeurosis of the Biceps, and overlapped by the Pronator Teres Muscle.

In the superior part of the Arm, the Brachial Artery is supported by the Triceps Muscle, from which it is separated by some cellular membrane, and by the Musculo-spiral Nerve and superior Profunda Artery. In the middle of the Arm, the artery lies on the tendon of the Coraco-brachialis Muscle, and is very close to the bone; and in the inferior part of its course it rests on the Brachialis Anticus Muscle. At the upper and inner side of the Arm, the Brachial Artery lies between the Coraco-brachialis and Triceps Muscles, but in the middle and lower thirds, it is between the Biceps and Triceps Muscles, which are connected to each other by the fascia of the Arm; in the middle third of the Arm, it should be particularly observed, that the belly of the Biceps overhangs the artery. The Brachial Artery is accompanied by two veins, one on either side; the Basilic Vein also sometimes runs superficial to it as far as the Axilla. The internal Cutaneous Nerve runs parallel and superficial to the artery, the Ulnar Nerve is on its ulnar and posterior side, and separated from it, in the inferior third of the

Arm, by the Intermuscular Ligament; in the upper third of the Arm, the Median or Brachial Nerve, and the external Cutaneous Nerve, are on the external or radial side of the artery, but in the middle third of the Arm, the Brachial Nerve crosses the artery superficially, and inferiorly it lies to its ulnar side, separated from it by some cellular membrane, and by one of the Venæ Comites; this relative position of the Median Nerve to the artery is subject to variety; near the Axilla it often lies on the ulnar side of the artery, and in the middle of the Arm it sometimes passes between the artery and the bone; but, inferiorly, the nerve very generally lies to the ulnar side. This circumstance should be recollected in the operation of tying the Brachial Artery.

When the artery arrives near the bend of the Elbow, it recedes a little from the surface, and passes into a space which is bounded externally by the Supinator-longus Muscle, internally by the Pronator Teres; the Brachialis Anticus Muscle and the Elbow-joint bound it superiorly and posteriorly, and the fascia of the Biceps covers it in front; into this space the Brachial Artery, Median Nerve, and tendon of the Biceps, all descend, the artery lying between the nerve and tendon, the latter being to its radial, and the former to its ulnar side; in this space, and in general opposite to the Coronoid Process of the Ulna, the Brachial divides into the Radial and

Ulnar Arteries; in size, the Ulnar is the principal branch, but in direction, the Radial appears the continuation of the Brachial.

The branches of the Brachial Artery are very numerous; few, however, observe any regular course, or have received distinct names; through its entire course it sends branches externally and internally; from its internal side arise its three principal branches, and which have been considered sufficiently regular and large to have received distinct names; these are, Arteria Profunda Superior, Profunda Inferior, and Anastomotica Magna. *In addition to* these, however, several small branches pass to the Triceps and integuments.

I.

ARTERIA PROFUNDA SUPERIOR.

Is generally the first branch of the Brachial; it arises a little below the tendon of the Teres Major Muscle, from the posterior part of the artery; it immediately sends off several branches to the Triceps and Coraco-brachialis Muscles, and some, which ascend along the Humerus and Deltoid Muscle to anastomose with the Circumflex and Acromial Thoracic Arteries; the superior Profunda Artery then

descends, inclining a little backwards and outwards between the bone and long portion of the Triceps, having the second and third divisions of this muscle on either side; it sends off several twigs to the Triceps, and about the middle of the Arm divides into two branches. One of these descends towards the Olecranon, between the Humerus and Triceps, supplying the latter, and sending branches to the Elbow-joint, which anastomose with the ulnar and interosseous recurrent arteries; the other branch of the superior Profunda may be named the Musculo-spiral Artery, as it accompanies the nerve of that name round the back part of the Humerus, it pierces the second portion of the Triceps, and descending towards the external Condyle, divides into several branches; some of these pass behind, others along, and some anterior to the ridge leading to the external Condyle; the anterior branches descend between the Supinator Longus and Brachialis-anticus Muscles, lie close to the bone, and are covered by the Musculo-spiral and external Cutaneous Nerves and the Cephalic Vein; these branches anastomose very freely with the Radial Recurrent Artery, while the external and posterior branches inosculate with the Interosseous Recurrent.

The superior Profunda Artery sometimes arises from the Sub-scapular or from the posterior Circumflex, and in some instances it is so large as to

appear like a division of the Brachial Artery itself, in which case it sends off the next branch, or the inferior Profunda; the Musculo-spiral Branch also is frequently very large, and may require a ligature in amputation of the Arm, particularly if there have been any long continued disease of the Elbow-joint; this artery lies very close to the bone, and escaping observation at the time of the operation, may bleed smartly some hours afterwards; the Surgeon should, therefore, examine for it, and with a tenaculum or forceps draw it out of a tendinous canal into which it frequently recedes.

II.

ARTERIA PROFUNDA INFERIOR.

THIS artery usually arises in the middle third of the Arm, opposite the insertion of the Coraco-brachialis Muscle, it pierces the internal Intermuscular Ligament, and descends obliquely inwards and backwards to the fossa between the internal Condyle and Olecranon Process, where it ends in a free inosculation with the posterior Ulnar Recurrent. The inferior Profunda at first lies on the Coraco-brachialis Tendon, then on the Brachialis Posticus, or third division of the Triceps, and is accompanied by the Ulnar Nerve, which lies on its internal or ulnar side.

This artery gives branches to the integuments and to the Brachialis-anticus Muscle, some of which inosculate with the Anastomotica Magna. In the dissected Arm, the inferior Profunda Artery appears at some distance from the Brachial, but if the Triceps be pressed forwards towards the Biceps, so as to place these muscles as nearly as possible in their natural relations, those vessels will be found very close to each other; so that, in cutting down upon the Brachial Artery, in the middle of the Arm, in the living subject, the inferior Profunda, from its situation, and from its being accompanied by the Ulnar Nerve, may be mistaken for the Brachial; this error, however, may be avoided by recollecting, that the Brachial Artery is the nearest to the Biceps, and is a little covered by that muscle; in general, also, there is a material difference in size between the two vessels.

III.

ARTERIA ANASTOMOTICA MAGNA,

Arises from the Brachial in the lower third of the Arm, runs inwards and a little downwards towards the internal Condyle, bends very tortuously across the Brachialis-anticus Muscles, pierces the internal Intermuscular Ligament, and between the Olecranon

Process and internal Condyle, anastomoses with the inferior Profunda, and with the posterior Ulnar Recurrent Arteries. As the Anastomotica Magna is crossing the Brachialis Muscle, branches ascend from it to meet the inferior Profunda, and others descend in front of the inner Condyle, and join the anterior Ulnar Recurrent; one or two small lymphatic glands may, in general, be seen attached to this artery or its branches.

From the radial side of the Brachial Artery arise several branches; these may be considered under the general name of Muscular Arteries; there are generally three or four of considerable size, one goes to the Coraco-brachialis, two or three to the Biceps, and one to the Brachialis-anticus Muscles; all these anastomose with each other and with the muscular branches of the Profundæ Arteries. About the middle of the Arm the Brachial Artery gives off from its outer side a branch called *Arteria Nutritia Humeri*; this artery generally pierces the tendon of the Coraco-brachialis Muscle, and sends several branches to the surrounding parts, it enters the bone obliquely downwards, and soon divides into many branches, which run in different directions to supply the cancelli and medullary membrane of the Humerus, and to anastomose with the other nutritious vessels which enter the bone at its extremities.

If the Humerus be fractured near its centre, this

artery may be injured, and may pour out blood in such quantity as may prevent or retard the process of bony union. I have heard of one case, in which an aneurism of this artery ensued on a fracture of the bone, and amputation was deemed necessary.

If the arteries of the Arm be minutely injected and carefully dissected, the Student will observe numerous anastomoses to exist from the Shoulder to the Elbow, some occur in the integuments, several in the muscles; and even round the bone many arteries may be seen inosculating with each other. Around the Elbow also a free communication takes place between the different branches of the Brachial Artery and the several Recurrents from the fore Arm, through which the Radial and Ulnar Arteries will receive an ample supply of blood, when the Brachial Artery shall have been obliterated near its inferior extremity; even if this trunk be obliterated near the Axilla, collateral circulation will be established through the inosculations of the Scapular, Acromial-thoracic, and Circumflex Arteries, with branches of the superior Profunda; and the anastomoses of the Profundæ Arteries, and Anastomotica Magna, with the recurrent branches of the Radial and Ulnar Arteries, will complete the chain of communication between the vessels of the Shoulder and those of the fore Arm.

Before the Student proceed to dissect the arteries

of the fore Arm, he should consider what practical deductions may be drawn from the dissection he has made of the Brachial Artery; he may first observe the practicability of compressing this artery in almost any part of its course, and may learn the direction in which the pressure should be applied in the different parts of the limb; if the artery is to be compressed in the upper part of the Arm, the compress should be placed on the ulnar side of the Humerus; and at any point inferior to this the Biceps must be the guide, and the compress should be small, so as to admit of being pressed a little under the inner edge of this muscle. The Brachial Artery is most favourably situated for compression as it is passing over the insertion of the Coraco-brachialis Muscle; pressure, however, applied in this situation is attended with acute pain, in consequence of the Median Nerve being unavoidably pressed with the artery against the bone.

The operation of tying the Brachial Artery may be required in cases of wound, of aneurism of the Brachial Artery, or of the Radial, Ulnar, or even of the Interosseous* Arteries in the upper part of the fore Arm. The Brachial Artery may be exposed in the upper part of its course in the following manner: the patient may be laid horizontally, or seated on a low

* *See* Dublin Hospital Reports, vol. iii, p. 135.

chair, and the affected Arm raised from the side, and placed on a table, the Hand supinated; feel for the pulsation of the artery, and observe the line of the Coraco-brachialis Muscle, and along the ulnar side of this muscle make an incision through the integuments about two inches and a half long, and divide the subjacent cellular membrane cautiously, so as to avoid injuring the internal Cutaneous Nerve or the Basilic Vein, which sometimes runs superficially as high as the Axilla; the fascia of the Arm is next to be divided in the same direction as the external incision. The operator should recollect, that in this situation the Ulnar and internal Cutaneous Nerves are on the ulnar side of the vessel, and that the external Cutaneous and Median Nerves are on its radial side, but that the Median Nerve in some subjects is superficial to the artery in this part of the Arm; if the fore Arm be flexed these several nerves become relaxed, and can be drawn to either side, then by removing some cellular membrane, the Brachial Artery and Veins may be observed. It will sometimes happen, that the artery, when exposed, does not pulsate, and there may be some difficulty in distinguishing it from the nerve or veins; alternately compressing the vessels at the inferior and superior extremity of the wound, may assist in the discrimination, and putting the Arm in a relaxed position may restore pulsation in the artery; the operator should

carefully separate the veins from the artery, and then pass the aneurism needle around the latter, directing it from the ulnar to the radial side, and avoiding the veins and nerves on either side.

Should two arteries be exposed, in consequence of a high division, the operator should endeavour to ascertain, by pressure, which vessel communicates with the wound or aneurismal sac, and apply the ligature accordingly; but if the pulsation cease, only, when both vessels are compressed, he will be justified in tying both, as he may then conclude that these arteries communicate with each other above the seat of disease or injury.

The Brachial Artery may be tied in the middle division of its course, by making an incision along the ulnar side of the Biceps Muscle, of the same extent and with the same caution as was recommended in the former operation: the fascia of the Arm being divided, the operator should bend the fore Arm, so as to relax the Biceps, and then, by raising the inner margin of this muscle, the Brachial Nerve will be exposed, lying superficial to the Brachial Vessels; (in some subjects, however, the nerve lies between the artery and bone;) this nerve is to be drawn inwards with a blunt hook, and the Biceps pressed outwards by a broad curved retractor, the Brachial Artery and Veins are then exposed, and the operation is to be concluded as before.

In performing the operation in this situation, there is danger of mistaking the inferior Profunda Artery and Ulnar Nerve for the Brachial Artery and Nerve, particularly if the collateral vessels have become enlarged in consequence of disease obstructing the flow of blood through the main trunk; hence, the necessity of directing the incision towards the Biceps or towards the axis of the Humerus, rather than inwards or backwards towards the Triceps.

For the cure of aneurism, which occurs at the bend of the Elbow, in consequence of the artery being wounded in performing venesection, the Brachial Artery should be tied in the inferior part of its course, and as near as possible to the aneurismal sac; in such a case the surrounding parts are often greatly changed, not only in their appearance, but in their relative situation; indeed in some cases the tumour itself will be the only guide to the artery which supplies it. In performing the operation in this situation, the Surgeon should recollect, that the Brachial Nerve is on the ulnar side of the artery.

The Student may now direct his attention to the relative position of the Cutaneous Veins to the artery at the bend of the Elbow; he should first replace the fascia of the Biceps, and observe how this binds down the artery into the triangular space which it covers, and from this he may infer how capable it is of restraining the growth and modifying the form of an

aneurism in cases in which the Brachial Artery has been wounded through this aponeurosis; if he replace the Cutaneous Veins, he will observe, that the Median Basilic runs nearly parallel to the Brachial Artery, but superficial to the aponeurosis of the Biceps, in consequence of which this vein is observed, in the living Arm, to stand out more prominent than the other Cutaneous Veins, and is, therefore, more frequently selected for blood-letting. The Student should particularly observe, that this fascia does not, in general, separate the vein and artery for any considerable distance, and he ought, therefore, to recollect, that, in performing venesection, if he perforate the Median Basilic Vein exactly opposite the angle of flexion of the Elbow, or a little above it, in these situations the artery is not separated from the vein, nor is it protected by this aponeurosis.

If the Basilic Vein be opened below the bending of the Elbow, and that the lancet pierce the vein and fascia of the Biceps, and then wound the Brachial Artery, the patient will, most probably, have an ordinary circumscribed aneurism, in consequence of the pressure which is immediately applied to stop the hæmorrhage exciting adhesive inflammation around the blood that has been effused beneath the fascia of the Biceps and of the fore Arm; in such a case, the Surgeon must tie the artery in the inferior di-

vision of its course, and as close to the disease as he possibly can.

Brachial aneurism, however, which commences at the bend of the Elbow, in consequence of a wound, is not always circumscribed, sometimes the tumour extends up the Arm between the Biceps and Triceps Muscles, the fascia of the Arm preventing its increase in a lateral direction; in one instance I saw the disease extend from the Elbow near to the Axilla. In this diffused aneurism, the Surgeon must tie the Brachial Artery in the upper part of its course, and apply moderate compression along the aneurismal sac; this plan of treatment succeeded in the case to which I have alluded, and in which the operation was performed by Mr. Wilmot in Jervis-street Infirmary, and a perseverance in the use of moderate compression for some weeks, caused the total disappearance of the disease.*

* Mr. Todd informs me, that during the last winter a case of this accident was admitted under his care in the Richmond Surgical Hospital, and was successfully treated without operation. The patient, a police officer, was of a full habit; the tumour was large, with strong pulsation, and the general swelling of the arm very considerable. Active depletion, moderate compression of the limb, an horizontal position, and latterly friction and compression more directly applied to the tumour, were the curative means resorted to. The tumour has been entirely absorbed, and the patient sustains no inconvenience whatsoever.

In no case of diffused or circumscribed aneurism at the bend of the Elbow, have I seen it necessary to open the sac or tie the artery below the tumour. Dr. Colles, whose experience and great opportunity for observation render every practical remark of his worthy of attention, thus expresses himself on this subject, in his Course of Lectures on the Theory and Practice of Surgery: "I have operated repeatedly, and with success, for the cure of Brachial Aneurism, in consequence of injury to the artery in performing venesection; I have also frequently assisted others in operating for the same cause, and with the same result, and I never yet found it necessary to open the aneurismal sac, or to look for the vessel below the tumour, or to apply more than one ligature around the artery, and which I think ought always to be tied as near as possible to the seat of the disease; for in this species of aneurism, the coats of the vessel have not undergone any morbid change, as is generally the case in aneurism in the inferior extremity."

In performing venesection, if the lancet wound the artery above the semilunar edge of the fascia of the Biceps, pressure may cause a direct adhesion between the edges of the opening in the back of the vein and in the front of the artery, so that at each systole of the Heart, part of the blood is propelled from the artery into the vein, causing this vessel to become varicose and distended im-

mediately in front of the artery; this affection is denominated an Aneurismal Varix. From the same causes adhesive inflammation may connect the vein and artery, but at some distance, in consequence, perhaps, of blood being effused between them; a small intervening sac will then be formed communicating with both vessels, and producing the same effects on the vein as in the aneurismal varix; this disease is named Varicose Aneurism. In neither of these last-mentioned forms of aneurism, is the operation of tying the Brachial Artery required, except in some rare instances of varicose aneurism, in which the intermediate sac has increased in size, and compressing the vein has extended itself as a common aneurismal tumour so as to require similar treatment.

Thus, from accident in venesection, four forms of aneurism may arise; first, circumscribed aneurism, filling up the hollow at the bend of the Elbow; secondly, diffused aneurism, in which the disease extends from the Elbow along the line of the artery towards the Axilla; in both these forms of the disease, the operation of tying the Brachial Artery may be necessary; thirdly, aneurismal varix; and fourthly, varicose aneurism: in neither of which will an operation be generally required, except under the circumstances above mentioned.

When the Radial Artery arises high in the Arm,

it descends parallel to the proper Brachial, and lies more superficial, particularly at the bend of the Elbow, and is, therefore, in greater danger of being wounded in opening the Median Basilic Vein; however, I have never seen, in any irregular distribution of the arteries of the Arm, any branch of importance run superficial to the fascia of the Biceps or of the fore Arm, although I have remarked, that the Radial Artery, in cases of this high division of the Brachial, is not so much overlapped by the Pronator and Supinator Muscles, as when it arises from the Brachial in the hollow at the bend of the Elbow.*

The Student may now proceed with the dissection of the Radial and Ulnar Arteries; he should first

* Every person who has been in the habit of dissecting arteries, must have observed great variety in the Brachial Artery, both in respect to the place in which it divides, as well as in the size of the superficial or irregular branch, which, however, in most instances becomes the Radial Artery. It is impossible to state in what proportion these varieties occur; they are met with more frequently in one season than in another. In the session of 1821-22, I examined the Brachial Arteries in forty injected subjects, and in four only was there a high division, and in each of these, it was the Radial Artery that arose thus high in the Arm. In the session of 1822-23 I again took notes of the appearance of the Brachial Arteries in forty injected subjects, and in seventeen of them irregularities in these arteries existed. In ten there was a high division of the Brachial

raise the integuments from the fore and back part of the Arm and Hand, leaving the general fascia uninjured, to the connexions of which he should attend.

The fascia of the fore Arm is continued from that of the Arm; it adheres to the condyles of the Humerus and to the muscles which arise from them, it receives additional fibres from the aponeurosis of the Biceps, it confines all the superficial muscles and tendons of the fore Arm, and sends processes beneath these to bind down the deeper seated muscles; it is very tense on the back of the fore Arm, and adheres to the Olecranon Process and to the posterior part of the Ulna; inferiorly, it is also connected to the Radius and to the annular ligaments

into the Radial and Ulnar Arteries; in three, a small branch arose from the upper part of the Brachial, and descending to the Elbow, it joined the Radial Artery; in two instances this superficial branch descended in the fore Arm beneath the superficial Flexors, and was distributed to the muscles in this region; and in two cases, this superficial branch accompanied the Brachial Nerve beneath the annular ligament of the Carpus, and joined the superficial palmar arch of arteries.

In these eighty subjects the Brachial Arteries of which I particularly examined, the Ulnar and Interosseous Arteries were perfectly regular. I have, however, seen instances in which the Ulnar Artery was the most superficial at the bend of the Elbow, and passed between the fascia, and the flexor, and pronator muscles.

of the Carpus. On the back of the Hand the integuments are thin and the fascia weak, but in the palm of the Hand the fascia is very strong, the integuments are very thick, and the adipose substance is of a peculiar granulated appearance, and supplied with a great number of small arteries. The Palmar Aponeurosis is united to the anterior annular ligament, and receives fibres from the tendon of the Palmaris Longus, and from the fascia of the fore Arm; it adheres to the muscles of the Thumb and of the little Finger, is extended over the tendons, nerves, and vessels, binds these down in the hollow of the Palm, and is very tense when the Fingers are extended; opposite the digital end of the four Metacarpal Bones, the fibres of this aponeurosis separate, and are inserted into the sheath of each of the Flexor Tendons, and into the sides of the first Phalanges. The Palmar Aponeurosis is composed of radiating fibres, which run from the annular ligament of the Carpus towards the Fingers, and before they separate to go to their insertion, they are crossed by very strong transverse bands.

The fascia of the fore Arm may be now divided, and by separating the Supinator Radii Longus Muscle from the Pronator Teres, the origin of the two principal arteries of the fore Arm will be exposed. The Radial Artery is most superficial in the fore Arm, but its terminating branches lie very deep in

the Hand; the Ulnar Artery, on the contrary, lies deep on the upper part of the fore Arm, and its termination in the Hand is superficial; the Ulnar is larger than the Radial, and gives off the Interosseous; the Radial, however, in direction, appears to be the continuation of the Brachial; the Student will find it most convenient to examine this artery first.

ARTERIA RADIALIS.

THE Radial Artery, whether it arise from the Brachial at the bend of the Elbow, or at any distance above this, always runs along the radial side of the fore Arm to the Wrist, (if a line be drawn from the middle of the bend of the Elbow to the Thumb, it will be parallel to the Radial Artery,) it then turns round the outer side of the Carpus, beneath the extensor tendons of the Thumb, and running forwards, sinks into the cleft between the metacarpal bones of the Thumb and index Finger, where it terminates by dividing into three branches.

The Student should first examine the relative anatomy of this artery in the fore Arm. In this region the Radial Artery is covered only by the integuments and general aponeurosis, and by the fascia which covers the deep-seated muscles. In the upper third of the fore Arm the Radial Artery is concealed by the Pronator Teres Muscle on its ulnar, and by the Supinator Longus on its radial side, by gently separating these, the artery is exposed; in the middle third it lies between the tendons of the Flexor Carpi Radialis on its ulnar, and Supinator Longus on its radial side, the tendon of the Supinator extending over it a little; in the inferior

third of the fore Arm, the tendon of the Flexor Carpi Radialis is still to its ulnar side, and the tendon of the Supinator Longus and the external edge of the Radius are to its radial side.

In the superior third of its course, the Radial Artery lies on the tendon of the Biceps, on a quantity of cellular membrane and fat, and on several branches of the Musculo-spiral Nerve, all which connect it to the Supinator Radii Brevis Muscle. In the middle third of the fore Arm, the Radial Artery lies on the tendon of the Pronator Teres, and on the radial origin of the Flexor Digitorum Sublimis. In the inferior third of the fore Arm, the Radial Artery lies on the Flexor Pollicis, on the Pronator Quadratus, and on the extremity of the Radius.

As the Radial Artery passes round the outer side of the Carpus, towards the cleft between the Thumb and index Finger, it lies upon the capsular and external lateral ligaments of the Carpus, and on the head of the first Metacarpal Bone; in this part of its course it is covered by the integuments and by the three extensor tendons of the Thumb.

In some subjects the Radial Artery turns round the Radius at the distance of an inch, or even more, above its inferior extremity, and then descends along the back of the Carpus to the angle between the Thumb and index Finger; a large cutaneous vein

and a branch of the Musculo-spiral Nerve run superficial and parallel to this portion of the artery. The Radial Artery then sinks into the cleft between the metacarpal bones of the Thumb and index Finger, behind the Abductor Indicis and Adductor Pollicis Muscles; in some cases it perforates these muscles; and in this space it divides into its three terminating branches.

The Radial Artery sends off a number of branches, few of which, however, are of sufficient size or importance to have received distinct names: almost immediately after its origin it sends off its first, and one of its principal branches.

1. ARTERIA RADIALIS RECURRENS is a large tortuous artery, it is concealed by the Supinator Longus, and lies upon the Supinator Brevis; its branches are entangled in a quantity of loose cellular membrane and in the divisions of the Musculo-spiral Nerve. The Radial Recurrent first runs outwards, then bends upwards, in an arched manner, and ascends in front of the external condyle of the Humerus, and between the Supinator Longus and Brachialis Anticus Muscles.

From the Radial Recurrent several branches descend to supply the Supinator Longus and Brevis Muscles, others are distributed to the Synovial Membrane, and to the Brachialis Anticus Muscle, and the continuation of the artery ascends close to the

Humerus, and inosculates with the Musculo-spiral Artery, a branch of the superior Profunda.

As the Radial Artery descends along the fore Arm, it gives off numerous small twigs to the muscles on each side, and about an inch above the lower end of the Radius it sends off the next branch of importance.

2. ARTERIA SUPERFICIALIS VOLÆ. This artery runs superficially downwards and inwards over the annular ligament of the Carpus, and over the origin of the small muscles of the Thumb, it distributes branches to these muscles and to the integuments of the palm of the Hand, and anastomoses with the superficial Palmar Artery from the Ulnar, thus completing the superficial palmar arch of arteries. There is great variety in the size and origin of the superficialis Volæ Artery; sometimes it is as large as the continuation of the Radial, and arises from it high in the fore Arm, and runs down parallel to it as far as the Wrist; in such a case it not only anastomoses very freely with the superficial Palmar Artery, but also sends a digital branch to the Thumb or index Finger; at other times the Superficialis Volæ is extremely small, and sometimes is altogether wanting.*

* To the Finger, feeling the pulse of an individual in whom the Superficial Volæ arose higher and was larger than usual, a sensation of a fuller and stronger pulsation might be communicated

3. ARTERIA ANTERIOR CARPI RADIALIS is a small branch; its name implies its situation; it runs across the lower extremity of the Radius beneath all the flexor tendons, supplies the ligaments and bones of the Carpus, and inosculates with the anterior Interosseous Artery, and with the corresponding branch from the Ulnar Artery.

As the Radial Artery runs along the side and back of the Carpus, it sends off the following branches:—

4. ARTERIA DORSALIS CARPI RADIALIS is much larger than the last described artery, it runs across the back of the Carpus beneath the extensor tendons, supplying the Synovial Membrane and bones of the Carpus, and anastomosing with a similar branch from the Ulnar Artery; it also sends branches upwards on the back of the Radius and Ulna, which inosculate with the Interosseous Arteries. The Dorsalis Carpi Radialis sometimes arises from the Radial Artery in the fore Arm above the Carpus, and turning round the lower end of the Radius, it terminates in the usual manner. This artery sometimes sends a branch to the Metacarpus, which runs across the Metacarpal Bones, supplying the integuments and

than was natural or consistent with the symptoms of disease under which the patient laboured. It may not be amiss then, in particular cases, to feel the pulsation of other arteries beside that of the Radial.

the posterior Interossei Muscles; this Metacarpal Artery sometimes arises from the trunk of the Radial Artery.

4, 5. ARTERIÆ DORSALES POLLICIS. In general there are two branches which run along the dorsum of the Thumb, one on the ulnar, the other on the radial side, they sometimes arise separately, and sometimes by one trunk; that which runs on the ulnar side sends a branch to the index Finger, called, Arteria Dorsalis Indicis. The Dorsalis Indicis and Dorsalis Pollicis Ulnaris often arise by a common trunk of considerable size, which will run as far as the fold of the integuments, between the Thumb and index Finger, and will there divide into its two branches. The Radial Artery then runs forwards between the Metacarpal Bones of the Thumb and index Finger, and beneath the posterior margin of the Abductor Indicis and Adductor Pollicis Muscles divides into its three last branches, viz. Arteria Magna Pollicis, Radialis Indicis, and Palmaris Profunda.

6. ARTERIA MAGNA VEL PRINCEPS POLLICIS, runs between the Abductor Indicis and Adductor Pollicis Muscles, along the ulnar side of the Metacarpal Bone of the Thumb, and at the digital end of this bone it divides into two branches, which run along the radial and ulnar side of the phalanges of the Thumb, and about the middle of the palmar aspect of the last phalanx they converge and form an

arch, from the convexity of which proceed several branches to the cellular membrane and to the integuments on the extremity of the Thumb, which are highly organized on this as well as on the Fingers. There is often a branch of communication between the superficial palmar arch and these digital branches of the Thumb.

7. ARTERIA RADIALIS INDICIS, runs along the radial side of the index Finger, and at the anterior edge of the Adductor Pollicis anastamoses with the last described artery and with a branch from the superficial palmar arch of arteries; it then continues its course along the side of this Finger to its last phalanx, when it inclines to the front, and anastomosing with the Digital Artery from the opposite side, ends in numerous branches, which are distributed to the cellular membrane and integuments in the same manner as in all the other Fingers.

8. ARTERIA PALMARIS PROFUNDA,* sinks deep into the palm of the Hand, between the Metacarpal Bones of the Thumb and index Finger, and runs across the Interossei Muscles and the four Metacarpal Bones near their carpal extremity; this artery is covered by the Flexor Tendons and Lumbricales

* The Student may postpone the dissection of this branch until he has traced the Ulnar Artery to its termination, and exposed all the superficial arteries in the palm of the Hand.

Muscles, and opposite the Metacarpal Bone, supporting the little Finger, it inosculates with the Arteria Communicans, a branch from the Ulnar Artery, thus completing the deep palmar arch. The convexity of this arch is directed towards the Fingers, and gives origin to four or five small branches which supply the Interossei Muscles; some of these branches run as far as the cleft between the Fingers, and anastomose with the Digital Arteries from the superficial palmar arch.

The Student may now consider in what situation the Radial Artery may be exposed during life, for the purpose of passing a ligature around it.

A Surgeon may be required to tie the Radial Artery in any part of its course in consequence of aneurism, or of wounds either of the trunk of the artery or of some of those branches which are distributed to the Thumb and Palm of the Hand, particularly of the Superficialis Volæ, or of that large branch which often runs in the fold of integument between the Thumb and index Finger.

The Radial Artery may be tied in any part of its course. In the middle and inferior third of the fore Arm this operation can be performed with facility, as the artery is in those situations almost superficial, and its pulsation can be felt; but in the superior third it is attended with some difficulty, as the artery

is overlapped by the Supinator Longus and Pronator Teres Muscles.

The Radial Artery may be tied in the superior third of the fore Arm by making an incision through the integuments about three inches long, commencing a little below the bend of the Elbow, and extending it obliquely downwards and outwards a little to the radial side of the middle line of the fore Arm; in this incision the branches of the Median Vein should be avoided. The fascia of the Arm is next to be divided in the same direction as the external incision; the Supinator Longus can then be separated from the Pronator Teres, and pressed towards the radial side of the wound; the deep fascia of the Arm being thus exposed, is also to be divided, and the Radial Artery and its accompanying veins are brought into view; the veins must be carefully detached from the artery. The Musculo-spiral Nerve in this situation lies to the radial side of the artery, and at some distance from it; the aneurism needle can be easily passed under the vessel, and it should be directed from its radial to its ulnar side.

The Radial Artery may be tied in the middle third of the fore Arm by making an incision two or three inches in length over the ulnar edge of the Supinator Longus Muscle, then by dividing the two layers of fasciæ, as in the last described operation, the artery will be exposed, and the aneurism needle

may be passed under it from its radial to its ulnar side, avoiding the veins and the Musculo-spiral Nerve, which in this situation lies to the radial side, and very near the artery.

The Radial Artery may be tied in the inferior third of the fore Arm by making an incision two or three inches long at the radial side of the tendon of the Flexor Carpi Radialis; the fasciæ are to be then divided, as in the former operations, and the artery is easily exposed.

ARTERIA ULNARIS.

THE Ulnar Artery runs obliquely from the division of the Brachial, towards the ulnar side of the fore Arm, and near the Wrist it bends a little outwards, or towards the mesial line, passes over the Annular Ligament on the radial side of the Pisiform Bone, to which it is attached by a strong band of fibres, which connect this bone to the Annular Ligament; the Ulnar Artery then runs along the Palm of the Hand, between the Palmar aponeurosis and the Flexor Tendons, towards the Metacarpal Bone of the index Finger, where it inosculates with the Arteria Superficialis Volæ and Radialis Indicis.

In this course the Ulnar Artery is covered, in the superior third of the fore Arm, by the superficial Flexors and Pronators, namely, the Pronator Teres, Flexor Carpi Radialis, Palmaris Longus, and Flexor Digitorum Sublimis; in the middle and inferior thirds of the fore Arm it is only covered by the integuments and general aponeurosis, and by a deep layer of fascia, which passes from the tendon of the Flexor Ulnaris to the Flexor Digitorum Profundus. In the inferior third of the fore Arm the pulsation of the artery can be felt, but not in the middle third, for

there the Flexor Ulnaris and Sublimis almost cover it; in the palm of the Hand the Ulnar Artery is covered by the integuments and palmar aponeurosis.

The Ulnar Artery, immediately after its origin, lies for a short distance on the Brachialis Anticus Muscle; in the three divisions of the fore Arm it rests on the Flexor Digitorum Profundus; at the Wrist it lies on the Annular Ligament; and in the Hand it crosses over the several tendons in that region.

The Ulnar Artery is accompanied by two veins, one at either side; the Median or Brachial Nerve is connected to the Ulnar Artery for about an inch, but this nerve then perforates the Pronator Teres, and is separated by the ulnar origin of this muscle from the artery, and then descends in the middle line of the fore Arm. At the lower part of the upper third of the fore Arm the Ulnar Nerve becomes attached to the artery, and accompanies it as far as the Hand; in the fore Arm the Nerve lies to the ulnar side of the artery, but on the Annular Ligament it is rather posterior to it. In this course the Ulnar Artery sends off several branches, of which the following are the principal:—

1, 2. ARTERIÆ RECURRENTES. The Arteria Recurrens, anterior and posterior, arises from the Ulnar, immediately below the Elbow-joint; they sometimes arise by a common trunk, which soon sub-

divides, sometimes they arise distinctly. The Anterior Recurrent Artery is the smaller of the two, it passes upwards beneath the Pronator Teres Muscle, on the anterior surface of the joint, and on the Brachialis Anticus Muscle, to all of which it gives several branches; it anastomoses with the Arteria Anastomotica Magna, and with branches from the Inferior Profunda. The Posterior Recurrent is an artery of very considerable size, it passes upwards and backwards beneath the Ulnar Nerve, behind the internal Condyle, and between the two origins of the Flexor Carpi Ulnaris; it gives several branches to this muscle, also to the lower part of the Triceps, and to the Synovial Membrane of the Elbow-joint, and in the fossa between the internal Condyle and Olecranon Process this artery terminates in a free inosculation with the Inferior and Superior Profundæ and Anastomotica Magna.

Immediately after its recurrent branches the Ulnar Artery sends backwards its third branch, viz. the *Interosseous Artery*, the dissection of which the Student may defer until that of the Ulnar Artery is concluded. As the Ulnar Artery descends along the fore Arm it sends off numerous branches to the muscles, one in particular, which arises immediately after the Interosseous Artery, and runs down the middle of the fore Arm along with the Brachial Nerve, and is distributed to the Superficial Flexors;

in some subjects this branch is very large, and passes beneath the annular ligament of the Wrist, along with the Flexor Tendons; in the palm of the Hand it becomes superficial, and joins the centre of the superficial palmar arch of arteries; in such a case if this arch or any of its branches be wounded, there must be considerable difficulty in restraining hæmorrhage, as mere pressure on the Radial and Ulnar Arteries could not suffice.

A little above the styloid process of the Ulna, the Ulnar Artery sends off two small branches, one to the back, the other to the front of the Carpus, named accordingly:—

4, 5. ARTERIÆ CARPI ULNARIS, ANTERIOR ET POSTERIOR, these arteries are similar in their course and termination to the corresponding branches of the Radial Artery, with which, and with the Anterior and Posterior Interosseous Arteries, they freely inosculate.

The Ulnar Artery, as it is passing over the Annular Ligament, continues to send off on either side small branches to the cellular membrane and integuments, and having arrived opposite the base of the Metacarpal Bone of the little Finger, divides into two branches, namely, Arteria Communicans vel Profunda, and Arteria Palmaris Superficialis.

6. ARTERIA COMMUNICANS VEL PROFUNDA, passes backwards between the Flexor Brevis and

Abductor Minimi Digiti Muscles, to which it gives many branches, it then joins the extremity of the Arteria Palmaris Profunda, the last branch of the Radial Artery, and thus completes the deep palmar arch of arteries; this branch of the Ulnar Artery is accompanied by the larger division of the Ulnar Nerve.

7. ARTERIA PALMARIS SUPERFICIALIS runs obliquely across the palm of the Hand towards the centre of the Metacarpal Bone of the index Finger, nearly parallel to that fold or wrinkle which is observed in the integuments of the palm when the Hand is half closed; this artery then ascends, and between the ball of the Thumb and index Finger it anastomoses with the Superficialis Volæ, and with a branch from the Arteria Radialis Indicis, thus forming a sort of semicircle, which is the superficial palmar arch of arteries. The convexity of this arch is directed towards the little and ring Fingers, the concavity towards the small muscles of the Thumb.

The superficial arch of arteries is nearer to the Fingers than the deep arch, and lies more obliquely in the palm of the Hand; the deep arch is placed almost transversely upon the Metacarpal Bones near their carpal extremities. Parallel to the deep arch of arteries, is a large branch of the Ulnar Nerve, whereas the superficial arch has parallel to it a large branch of the Brachial or Median Nerve, which unites with

a small branch of the Ulnar Nerve, and forms an arch of nerves which lies behind that of the arteries; from this arch of nerves Digital Branches pass off to the Fingers, accompanying the Digital Arteries; opposite each cleft, between the Fingers, the Digital Artery perforates its accompanying nerve, and as they run along the side of the Finger, the nerve lies most superficial, and is constantly sending off branches which twine around the artery and form a plexus upon its coats; on the last phalanx the nerve and artery enlarge, and the latter again perforates the former, they then terminate in minute branches which are distributed to the integuments and cellular membrane of the extremity of the Finger.

From the superficial palmar arch of arteries numerous branches arise; from its concavity several small twigs pass up towards the Carpus, supplying the Tendons, the Lumbricales Muscles, &c., and anastomose on the Annular Ligament with small branches from the Radial and Ulnar Arteries. From the convexity of this arch arise, in general, four digital arteries; the first, or internal, runs to the ulnar side of the little Finger, it supplies its small muscles, and then runs along its ulnar side to its last phalanx.

The second and third, or middle Digital Arteries, run to the cleft between the little and ring Finger, and to that between the ring and middle Finger,

and each divides into two branches, which run along the opposed sides of each of those Fingers to their extremities.

The fourth, or external Digital Artery, runs to the cleft between the middle and index Fingers, and in the same way supplies the radial side of the middle, and the ulnar side of the index Finger; the radial side of this latter Finger being supplied by the Arteria Radialis Indicis, from the Radial Artery.

All these digital arteries correspond to each other in their course and termination, they run along the anterior edge of the side of the phalanges of the Fingers, as far as the middle of the last phalanx, where those of opposite sides converge, increase in size, and unite, so as to form an arch, the convexity towards the extremity of the Finger; from this arch arise numerous branches, which, together with branches of the Digital Nerves, are distributed to the cellular membrane and papillæ of the cutis.

As the Digital Arteries run along the sides of the Fingers, they send several branches both before and behind the Phalanges, which are surrounded by their inosculations; the synovial sheaths of the Tendons, and of the several articulations, are supplied by these; near their termination several branches are sent to the back part of the last phalanx, which form a plexus of arteries in the cellular membrane and cutis beneath the Nail.

The Student may now consider in what situations the Ulnar Artery can be most easily exposed during life. In the superior third of the fore Arm, the great depth at which this artery lies from the surface, and the number of muscles which cover it, render it impracticable to pass a ligature around it; but in the middle and inferior thirds of the fore Arm, the artery is comparatively superficial, and the Flexor Carpi Ulnaris Muscle will serve as a guide to it.

A Surgeon may be required to tie the Ulnar Artery in consequence of aneurism, or of a wound of the artery itself, or of any of its palmar branches.

The Ulnar Artery may be tied in the middle or lower third of the fore Arm, by making an incision through the integuments, about three inches long, on the radial side of the Flexor Carpi Ulnaris; the aponeurosis of the fore Arm is then to be divided in the same direction; the Flexor Carpi Ulnaris, which in the middle of the fore Arm nearly covers the artery, is to be drawn inwards from the Flexor Sublimis; the deep layer of fascia being next divided, the Ulnar Artery and its accompanying veins are brought into view, the Ulnar Nerve is on their ulnar side; the veins are to be detached from the artery, and the aneurism needle should be passed under the latter from its ulnar to its radial side, avoiding the Ulnar Nerve, which, near the Wrist, lies rather behind the artery.

ARTERIA INTEROSSEA.

THIS artery, which was before mentioned as the third branch of the Ulnar Artery, arises from this vessel while covered by the Pronator and superficial Flexor Muscles; it passes backwards, downwards, and a little outwards, towards the Interosseous Space, at which it arrives opposite the tubercle of the Radius; it first sends off a few insignificant branches, named Anterior Recurrent *Arteries*, these ascend towards the coronoid process of the Ulna, assist in supplying the Elbow-joint, and anastomose with the different branches before described in this situation. At the upper edge of the Interosseous Ligament, the Interosseous Artery divides into two branches, named the Anterior and Posterior Interosseous Arteries. The Anterior descends on the surface of the Interosseous Ligament, accompanied by a long branch of the Median Nerve, and covered by the Flexor Pollicis and Flexor Profundus Muscles, and having arrived at the superior edge of the Pronator Quadratus Muscle, it divides into two branches, one supplies this muscle, and descends in front of the Carpal Bones, on which it anastomoses with the anterior carpal branches of the Radial and

Ulnar Arteries, and with the deep palmar arch; the other branch pierces the Interosseous Ligament, descends along the posterior surface of the Radius, and divides into a number of branches, which inosculate freely with the posterior Carpal and posterior Interosseous Arteries.

The posterior Interosseous Artery passes to the back of the fore Arm, through the interosseous space, between the upper edge of the Interosseous Ligament and the oblique ligament of the Elbow-joint, and is covered posteriorly by the Anconæus and Extensor Digitorum Communis Muscles: it immediately divides into two branches of nearly equal size; the ascending is named the posterior Interosseous Recurrent; it lies between the Anconæus and Supinator Brevis Muscles, ascends between the external Condyle and Olecranon Process to the Triceps Muscle, in which it anastomoses with the Radial Recurrent, Musculo-spiral and posterior branches of the superior Profunda, and sends branches towards the Olecranon Process, which meet some from the Ulnar Recurrent Artery, with which they inosculate.

The descending branch of the posterior Interosseous Artery lies more superficial than the anterior Interosseous; it is not on the Interosseous Ligament, but runs between the divisions of the Extensor Digitorum Communis, and of the extensors

of the Thumb; near the Wrist it divides into three sets of branches; the middle anastomoses with the posterior branch of the anterior Interosseous Artery, the external with the Arteria Dorsalis Carpi Radialis, and the internal with the Dorsalis Carpi Ulnaris.

In amputation of the fore Arm, in addition to tying the Radial and Ulnar Arteries, the Surgeon ought to search for the interosseous vessels, particularly the Anterior, which lies concealed not in the centre of the interosseous space, but close to the Radius.*

The integuments of the palm of the Hand are very vascular, and slight wounds in this situation often bleed profusely, not merely at the time of the accident, but they are peculiarly liable to secondary hæmorrhage. The structure of the parts, and the free anastomoses between the different arteries in the Hand, may account for this; the density of the cellular tissue, and the numerous branches which each vessel gives off, serve to retain it in its situation, so that when an artery is divided it cannot retract so as to close itself, nor can an ecchymosis form around the divided vessels, in this situation, as easily as in other parts of the body.

* It often happens that the arteries of the fore Arm retract after amputation of the Hand, and do not bleed; and I have heard many of our hospital Surgeons say, that they have performed this operation without tying a vessel, and that hæmorrhage did not follow: however, I would recommend in all cases, whether the arteries bleed or not, that they should be secured by ligatures.

In a simple incised wound of the palm of the Hand there is often considerable difficulty in restraining hæmorrhage; when the Surgeon examines the wound, in order to secure the bleeding vessel, he can only observe that the blood appears to flow from several orifices, either in a continued stream or *per saltum*, but he cannot fix the tenaculum in any particular artery, neither does approximating the edges of the wound restrain the hæmorrhage; if he enlarge the wound with the intention of exposing the vessel, he only increases the difficulty, as in each attempt he will divide several others. In a wound in this situation, unless the Surgeon can see any particular vessel bleeding, and so situated as to admit of a ligature being applied to it, he had better not use either the tenaculum or knife; and if approximating the edges of the wound, and making pressure by bandage and compress, fail in checking the hæmorrhage, he should then try graduated compression, first filling the wound from the bottom with a small piece of sponge, and laying over this, small compresses, which are then to be secured by bandage. While the Surgeon is applying these compresses, an Assistant should compress the Radial and Ulnar Arteries a little above the Wrist, or put a tourniquet on the Brachial Artery; should hæmorrhage even then supervene, the Surgeon should tie one or both of the arteries of the fore

Arm, first endeavouring to ascertain from which of these arteries the divided vessel is derived; this may be conjectured from the situation of the wound, and from alternately compressing the Radial and Ulnar Arteries; if the wound be on the ulnar side of the palm, near the Pisiform Bone, there is almost a certainty that either the Ulnar Artery or some of its branches have been wounded, and in such a case tying the Ulnar Artery, and making compression at the part, will, in all probability, prevent further bleeding. On the contrary, should the wound be near the Thumb, or between the Thumb and index Finger, and if compressing the Radial Artery diminish or stop the flow of blood, the Surgeon may expect that tying the Radial Artery and applying pressure on the wound, may be attended with success; if, however, he find that tying one artery does not effect the object of commanding the flow of blood, he must then tie both arteries above the Wrist, and even then it may happen that the inosculations between the Interosseous Arteries or some large muscular branch, and the palmar arch, will permit the hæmorrhage to continue; this hæmorrhage, however, may, in all instances, be restrained by local pressure.*

* It is remarkable, that the free and deep incisions which we are frequently called upon to make into the palm of the Hand, for abscesses arising from neglected paronychia, or other causes, are seldom followed by hæmorrhage.

GENERAL OBSERVATIONS.

THE Student having now concluded the dissection of the arteries of the Neck and superior extremity, may reconsider the various inosculations that exist between these vessels in the different regions of the Neck, Axilla, Arm, fore Arm, and Hand, and he may contemplate the chain of vascular communication extending from the Shoulder to the Fingers, so that if the main artery of the superior extremity be obliterated in any part of its course, he may comprehend those several links by which collateral circulation can be established; for it is well known that in a few hours after the operation of tying the principal artery, the pulse at the Wrist may be distinctly felt.

This communication is maintained partly by distinct vessels, which are rendered obvious by dissection; such exist around the Scapula and Elbow, and in the Hand; during life, however, there are numerous inosculations between small arteries from distant sources in the integuments and cellular membrane through the whole of the superior extremity, even on the periosteum, and within the bones; these inosculations the Dissector seldom has an opportunity of observing, but they constitute a complete vascular tissue, extending from the Shoulder to the Fingers. Indeed a careful dissection of the arteries

of a limb, in which the main trunk has been for some time obliterated, clearly proves, that the anastomosing arteries are derived not from any one particular series of vessels, but that they are supplied by every contiguous ramification. It cannot, however, be uninteresting to the Student to reflect on those particular vessels which constitute the more obvious and direct media of communication, in case obstruction to the flow of blood exists in any part of the artery of the superior extremity. Suppose this obstruction to have occurred in the Subclavian Artery in the first stage of its course, and before it has given off any branch, the Arm will be then indebted for its principal supply of blood to the following inosculations:—The Vertebral Artery, from its anastomosis with the opposite Vertebral, and with the internal Carotid Arteries, will receive a considerable share of blood, which it will transmit into the Subclavian beyond the obstruction; the inferior Thyroid Artery, from its free communication with the superior Thyroid, will contribute to the same effect. But should the obstruction of the Subclavian extend as far as the Scaleni Muscles, and have obliterated the mouths of all its large branches, then blood will be transmitted to the Shoulder and Arm through the inosculations of the superior Thyroid, the occipital and muscular branches of the external Carotid with the ascending branches of the

inferior Thyroid, Supra-scapular and Transversalis Colli Arteries, and through the descending branches of these three last-named vessels, it will flow into the Sub-scapular, Thoracica-acromialis, and Circumflex, and thus be carried into the trunk of the Axillary Artery.

If the Axillary Artery be obstructed above the Subscapular and Circumflex Arteries, the inosculations around the Scapula will be still more direct and free than in the case last supposed. But should the obstruction in the Axillary Artery include the origins of the Subscapular and Circumflex, collateral circulation will be then established not only through the inosculations around the Scapula, but also through those which exist between the Circumflex and Subscapular Arteries, and the branches of the Profunda Humeri, and through this last-named vessel the blood will enter the trunk of the Brachial Artery. Suppose even that the obstruction extended through the Axillary and Brachial Artery, and included the origin of the superior Profunda, then the descending branches of this last-named artery will conduct the blood into the recurrent branches of the Radial, Interosseous, and Ulnar Arteries; in such a case then, the Circumflex, Subscapular, and Profunda, will transmit the blood from the cervical and scapular branches of the Subclavian into the Recurrent Arteries from the fore Arm.

The anastomosis between the arteries in the fore Arm are so free and frequent, that it is unnecessary to dwell on their capability to establish a collateral circulation in case one or both of these arteries be obliterated.

The communication between the different arteries in the Hand and on each of the Fingers, are so numerous and open, as in cases of wounds, to prove a source of danger to the patient, and of embarrassment to the Surgeon. Both in the superior and inferior extremity, the further the anastomoses are removed from the trunk towards the extremity of the limb, the larger and more manifest they become; these facts, as Professor Scarpa* observes, clearly show, that nature has provided amply for the ease and equable distribution of the blood through the extremities, not only by the numerous anastomoses, but also by forming these anastomoses the larger in proportion to the greater distance of the parts from the Heart, and, therefore, the less the impetus which the blood receives from it.

From a review then of the arterial anastomoses in the Neck and superior extremity, the Student will, doubtless, come to the following conclusion, which

* *See* a Treatise on the Anatomy, Pathology, and Surgical Treatment of Aneurism, by ANTONIO SCARPA, translated by J. H. WISHART, page 48.

that distinguished professor, whose words I have just quoted, has deduced from a careful observation of these inosculations, and with which I shall close this first part of the Surgical Anatomy of the Arteries :—

"If," says Scarpa, "we add to all these anastomoses existing among the arteries of the superior extremity, the almost innumerable communications which occur between the arteries of the common integuments and of the cellular substance, both subcutaneous and inter-muscular, through the long tract from the Neck to the Fingers, which arteries are derived from many origins, and constitute together a vast vascular plexus extended over the whole length of the superior extremity, the sum of the described anastomoses is so prodigiously increased, that no one who is acquainted with this structure, would hesitate for a single moment to believe, that the artery of the superior extremity may be safely tied at any point, without any fear of destroying the circulation and life of the lower part of the limb. Ever since the art of injection was introduced into anatomy, and cultivated, these arterial communications have been discovered to be very much extended, not only between the arteries of the distinct parts of each limb, but also between those of different divisions of the arterial system. To this system may

be justly applied the saying of Hippocrates, *in toto corpore unus consensus et una conspiratio;* for it may be boldly stated, that the whole body is an anastomosis of vessels—a vascular circle."

END OF VOL. I.

SURGICAL ANATOMY

OF

THE ARTERIES.

ADVERTISEMENT.

The SECOND VOLUME of this work will be shortly published, and will contain a description of the Surgical Anatomy of the Arteries, of the Thorax, Abdomen, Pelvis, and Inferior Extremities. An INDEX to the entire work will be added.